Addendum to the Final Subsequent Environmental Impact Report (State Clearinghouse No. 2001051092) Approved August 23, 2010

Seawater Desalination Project at Huntington Beach: Outfall Modifications—Modifications to the Multiport Diffuser Design

Prepared by:
California Regional Water Quality Control Board, Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339
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Introduction

This is an addendum to the Final Subsequent Environmental Impact Report for the Seawater Desalination Project at Huntington Beach (2010 FSEIR) (State Clearinghouse No. 2001051092) that was certified by the City of Huntington Beach on August 23, 2010 and to the Final Supplemental Environmental Impact Report for the Outfall/Intake Modifications to the Project and Lease Amendment Project (2017 FSEIR) (State Clearinghouse No. 2001051092) that was certified by the State Lands Commission on October 19, 2017 (Addendum).

Poseidon Resources (Surfside) LLC (Poseidon Water) submitted a report of waste discharge and an application for renewal of their waste discharge requirements and National Pollutant Discharge Elimination System (NPDES) permit for the Huntington Beach Desalination Facility, and a request for a Water Code section 13142.5, subdivision (b) (section 13142.5(b)) determination to the Santa Ana Regional Water Quality Control Board (Santa Ana Water Board) on June 30, 2016 and March 15, 2016, respectively. The renewal of the Facility's NPDES permit is exempt from the California Environmental Quality Act (CEQA) as provided in Water Code section 13389; however, the Water Code section 13142.5(b) determination must comply with applicable CEQA requirements.

As part of the review process for the Water Code section 13142.5(b) determination, the Santa Ana Water Board engaged an independent reviewer to evaluate Poseidon Water's proposed multiport duckbill diffuser. The reviewer ultimately concluded that the proposed diffuser was not the best available design or technology feasible to minimize mortality of all forms or marine life; the Santa Ana Water Board concurred with the reviewer's findings. To comport with the findings of the third-party review, Poseidon Water modified the multiport diffuser design. The modifications to the multiport diffuser design do not involve new significant environmental effects or a substantial increase in the severity of previously identified significant effects and therefore do not require preparation of a subsequent environmental impact. (CEQA Guidelines, § 15162, subd. (a)(1).) This Addendum, prepared by the Santa Ana Water Board as a responsible agency under the CEQA, evaluates the environmental impacts associated with the modifications to the multiport diffuser design (hereafter: modified diffuser).

Project Background

Poseidon Water has proposed to construct a new desalination facility in Huntington Beach, California: the Huntington Beach Desalination Facility (Project). The Facility must comply with Water Code section 13142.5(b), which requires that a new or expanded desalination facility use the best available site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life.

As the CEQA lead agency, the City of Huntington Beach (City) prepared and adopted a Final Environmental Impact Report (FEIR) for the Project in 2005. Due to changes in the Project, changes in circumstances surrounding the Project, and the availability of new information, the City prepared and certified the 2010 FSEIR. The 2010 FSEIR evaluated the potential environmental impacts of the Project assuming the desalination facility would use the existing AES Huntington Beach LLC Huntington Beach Generating Station (HBGS) seawater intake and outfall pipelines for its operations.

In May 2015, the State Water Resources Control Board (State Water Board) adopted an amendment to add chapter III.M to the Water Quality Control Plan for the Ocean Waters of California (Ocean Plan) to establish a statewide framework for regional water boards to apply when making determinations under Water Code section 13142.5(b). As relevant here, the Ocean Plan states the following:

- "If subsurface intakes are not feasible, the regional water board . . . shall require that surface water intakes be screened. Screens must be functional while the facility is withdrawing seawater." (Ocean Plan, chapter III.M.2.d(1)(c)(i).)
- "The preferred technology for minimizing intake and mortality of all forms of marine life resulting from brine discharge is to commingle brine with wastewater (e.g., agricultural, municipal, industrial, power plant cooling water, etc.) that would otherwise be discharged to the ocean. ..... Multiport diffusers are the next best method for disposing of brine when the brine cannot be diluted by wastewater and when there are no live organisms in the discharge. Multiport diffusers shall be engineered to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize mortality of all forms of marine life." (Ocean Plan, chapter III.M.2.d(2)(a) and (b).)

In 2016, Poseidon Water applied to the California State Lands Commission to amend their lease to address modifications to the Seawater Desalination Project in response to these requirements of the Ocean Plan (Lease Modification Project). The Lease Modification Project included the following changes to the proposed Project:

- Installation of four 1-millimeter wedgewire screens with a through-screen velocity of 0.5 feet per second or less on the offshore end of the seawater intake pipeline about 1,650 feet offshore to reduce entrainment and impingement;
- Installation of a multiport duckbill diffuser on the offshore end of the discharge pipeline about 1,500 feet offshore to enhance brine mixing with seawater;
- Reduction of seawater intake volume, because of the above technology modifications, to 106.7 million gallons per day (MGD) (approximately 30 percent less source water than the 152 MGD volume approved by the State Lands Commission in 2010).

The State Lands Commission evaluated the potential environmental impacts of the Lease Modification Project in the 2017 FSEIR.

The Santa Ana Water Board has issued two NPDES permits and waste discharge requirements for the Project. Most recently, on February 10, 2012, the Santa Ana Water Board adopted waste discharge requirements for the Huntington Beach Desalination Facility (Order No. R8-2012-0007, NPDES No. CA8000403) (2012 Order), renewing the

NPDES permit that was originally issued for the proposed Project in 2006 (Order No. R8-2006-0034). The 2012 Order permitted Poseidon Water to discharge a maximum daily flow of 60.3 million gallons per day (MGD) of wastewater (54 MGD of concentrated seawater and 6.3 MGD of filter backwash). The Project was permitted to operate in a co-located mode with the AES HBGS by using HBGS cooling water discharge as its feed water. The Project was also permitted for temporary stand-alone operations that would allow Poseidon Water to intake seawater using HBGS intake pumps when HBGS operations did not provide 126.7 MGD in feed water. The 2012 Order expired on February 1, 2017.

Poseidon Water submitted a report of waste discharge and application for the renewal of their NPDES permit and waste discharge requirements on June 30, 2016. Poseidon Water also submitted a request for a Water Code section 13142.5(b) determination on March 15, 2016. As part of the review of the section 13142.5.(b) determination request, the Santa Ana Water Board engaged Dr. Phillip J.W. Roberts, an independent reviewer, to review Poseidon Water's proposed multiport duckbill diffuser that was evaluated in the 2017 FSEIR. Dr. Roberts prepared two reports based on his review: *Brine Diffusers and Shear Mortality* (April 2018) (Roberts Diffuser Design Report) and *Brine Diffusers and Shear Mortality: Application to Huntington Beach* (April 2018) (Roberts HB Diffuser Report). In the Roberts HB Diffuser Report, Dr. Roberts ultimately concluded that the duckbill diffuser was not the best available design or technology feasible to minimize intake and mortality of marine life.

Poseidon Water modified their multiport diffuser design to minimize shearing mortality consistent with the findings of the Roberts Diffuser Design Report and the Roberts HB Diffuser Report. Poseidon Water submitted the modified diffuser design along with an environmental analysis of the modifications to the Santa Ana Water Board on August 3, 2018. (Attachment 1.) In response to comments from the Santa Ana Water Board and the State Lands Commission, Poseidon Water submitted additional environmental analyses. (Attachments 1 and 4.) Then, on February 5, 2019, Poseidon Water submitted a modification to the alignment of the modified diffuser design. (Attachments 2 and 3.)

Purpose of Addendum

This Addendum evaluates the potential impacts of the installation, maintenance, and operation of the modified diffuser as compared to the 2017 duckbill diffuser analyzed in the 2017 FSEIR. Under CEQA, the lead agency or a responsible agency shall prepare an addendum to a previously certified Final EIR if some changes or additions are necessary to the prior EIR, but none of the conditions calling for preparation of a subsequent or supplemental EIR have occurred. (CEQA Guidelines, §§ 15162, 15164.) Once an EIR has been certified, a subsequent EIR is only required when the lead agency or responsible agency determines that one of the following conditions has been met:

1) Substantial changes are proposed in the project, or substantial changes occur

with respect to the circumstances under which the project is undertaken, which require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects (CEQA Guidelines, § 15162b, subd. (a)(1), (2)); or

2) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete, shows any of the following:
   a) The project will have one or more significant effects not discussed in the previous EIR;
   b) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
   c) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
   d) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative (CEQA Guidelines, § 15162, subd. (a)(3)).

The Santa Ana Water Board has evaluated the potential environmental impacts of the modified diffuser as set forth below. The Santa Ana Water Board, acting as a responsible agency, has determined that the modifications to the diffuser design do not meet any of the conditions listed in CEQA Guidelines section 15126, subdivision (a), that would require the preparation of a subsequent or supplemental EIR. Accordingly, this Addendum to the 2010 FSEIR and 2017 FSEIR is the appropriate environmental documentation for the modifications to the multiport diffuser and fully complies with CEQA.

This Addendum does not include an analysis of purported changes to the distribution system. Neither Poseidon Water nor Orange County Water District (OCWD) has proposed a change to the distribution system that was analyzed in the 2010 FSEIR that can be meaningfully analyzed at this time. OCWD has suggested that it may inject desalinated water into the groundwater basin if they execute an agreement with Poseidon Water to purchase the Project's desalinated water. However, OCWD has emphasized that it is still exploring options for the desalinated water and its distribution plans remain uncertain. To analyze such a speculative change at this stage, the Santa Ana Water Board would need to make assumptions about critical details such as how much water will be injected and where the injections would take place. An analysis of hypothetical changes would not provide the Board or the public with useful information.

An addendum does not need to be circulated for public review but can be attached to the Final EIR. (CEQA Guidelines, § 15164, subd. (c).) The Santa Ana Water Board will consider this Addendum together with the 2017 FSEIR and the 2010 FSEIR, and the 2015 Substitute Environmental Document for the Desalination Amendment prior to taking any approval action on the Water Code section 13142.5(b) determination for the Project. (CEQA Guidelines, § 15164, subd. (d).)

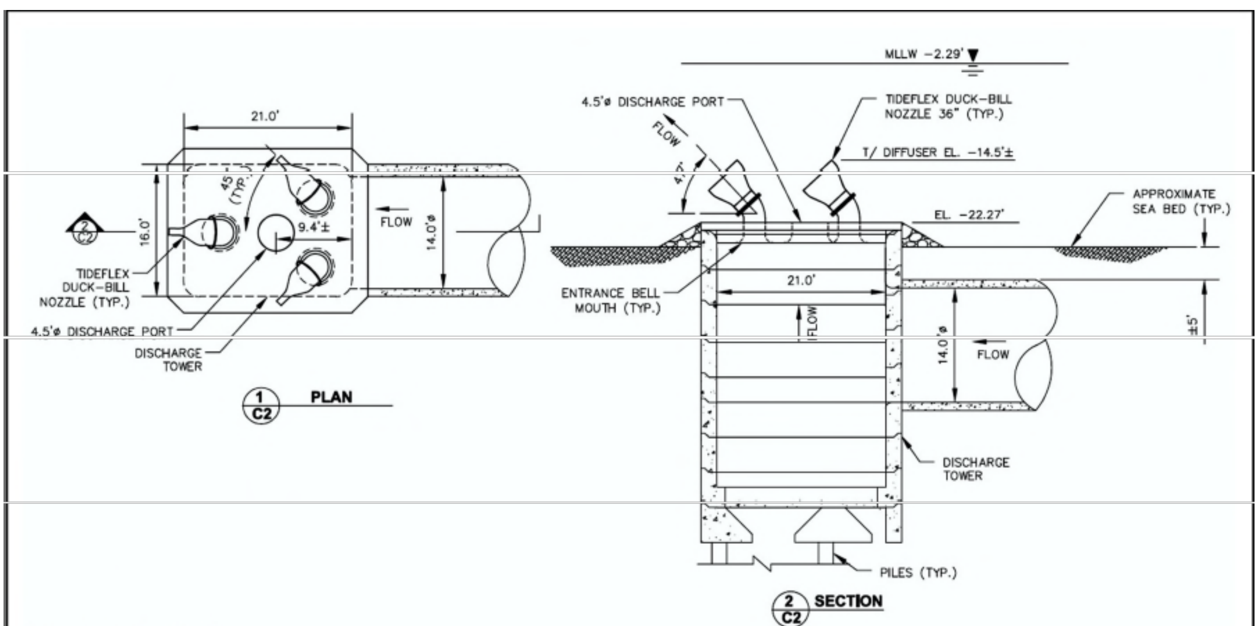
Modifications to the Multiport Diffuser

<u>2010 FSEIR</u>

When the Project was evaluated by the City in the 2010 FSEIR, Poseidon Water proposed to use the existing HBGS outfall structure with no modifications. (2010 FSEIR, p. 3-8.) The 2010 FSEIR considered a discharge diffuser as an alternative design to the then-proposed outfall design, but the alternative was eliminated from further consideration because it did not provide substantial benefits in terms of impact avoidance or reduction. (2010 FSEIR, pp. 6-38 to 6-39; see also 2017 FSEIR, pp. 2-19 to 2-20.)

<u>2017 FSEIR</u>

As part of the Lease Modification Project, Poseidon Water proposed to install a multiport diffuser with three 36-inch diameter duckbill valves and one 54-inch diameter central port on top of the existing HBGS discharge tower, which would be lowered to maintain the existing tower height (Figure 1).



Source: Alden 2017.

Figure 1. 2017 duckbill diffuser designs reproduced from 2017 FSEIR.

The 2017 duckbill diffuser would have occupied the same physical space as the existing HBGS discharge tower; however, the riprap surrounding the discharge tower would have been side cast and reconfigured resulting in an increase of the total area footprint (with the riprap included) by approximately 4,000 square feet.

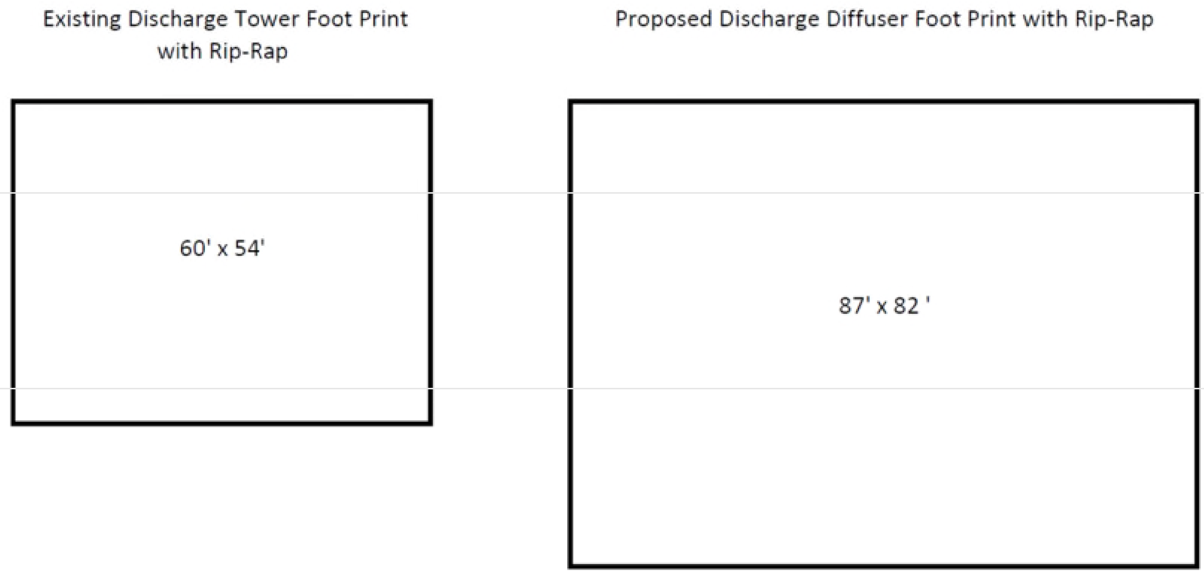


Figure 2. Previously anticipated benthic footprint of the 2017 duckbill diffuser design analyzed in 2017 FSEIR. Figure is reproduced from 2017 FSEIR.

The 2017 FSEIR evaluated the potential environmental impacts associated with the installation and operation of the 2017 duckbill diffuser design and the increase in the benthic area footprint of the outfall tower and riprap to a total of approximately 7,134 square feet.

The 2017 duckbill diffuser design installation did not require dredging, so the 2017 FSEIR did not analyze dredging impacts associated with the diffuser. However, the 2017 FSEIR did analyze the dredging and trench construction for the intake screens, estimating that 1,000 to 3,300 cubic yards of soil would be excavated to install the screens.

2019 Diffuser Modifications—Description of Project Changes

The modified diffuser design proposed by Poseidon Water would incorporate two 7-port linear diffuser sections connected to the seaward and shoreward sides of the existing discharge tower and would be oriented perpendicular to the shore to minimize wave loading forces on the diffuser. Each linear diffuser section would consist of a 4-foot diameter pipe header and each port would be equipped with a duckbill type check valve. The modified diffuser would be placed directly on the seabed on concrete pipe saddles that would secure the pipes.

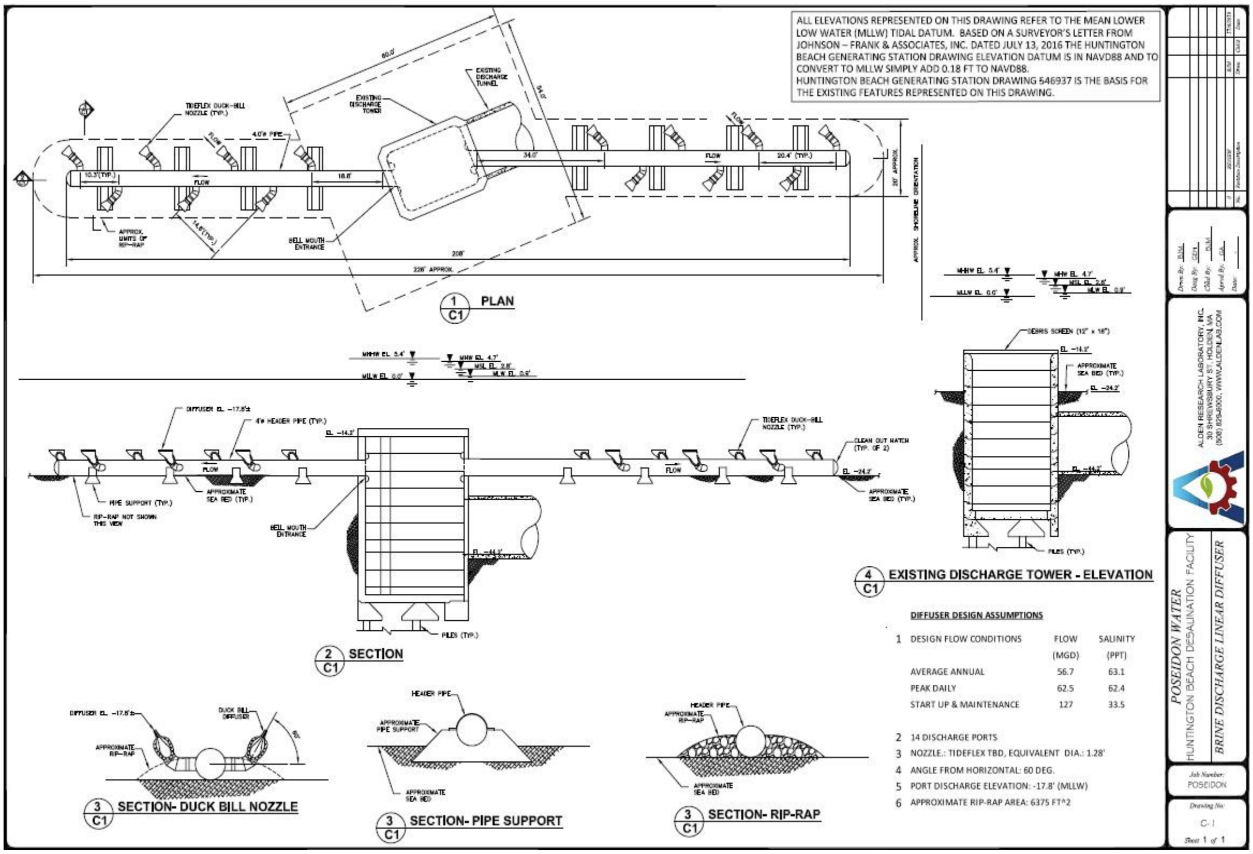


Figure 3. New linear diffuser design provided by Alden Labs on behalf of Poseidon Water (Attachment 1)

Riprap would be placed around the pipes and the existing discharge tower to avoid scour under the diffuser’s structures. The existing discharge tower and the modified diffuser would be approximately 208 feet long, and the riprap area will increase the total length to approximately 226 feet. The modified diffuser riprap area would occupy an area of approximately 226 feet by 20 feet, including a portion of the existing discharge tower riprap area. This would decrease the diffuser footprint (including the protective riprap) from the approximately 7,134 square feet for the 2017 duckbill diffuser design analyzed in the 2017 FSEIR to approximately 6,375 square feet for the modified diffuser, existing discharge tower, and riprap area, for a total reduction of approximately 759 square feet. The new footprint would extend beyond the area identified in the 2017 FSEIR by approximately 65 feet, both seaward and shoreward, from the existing discharge tower.

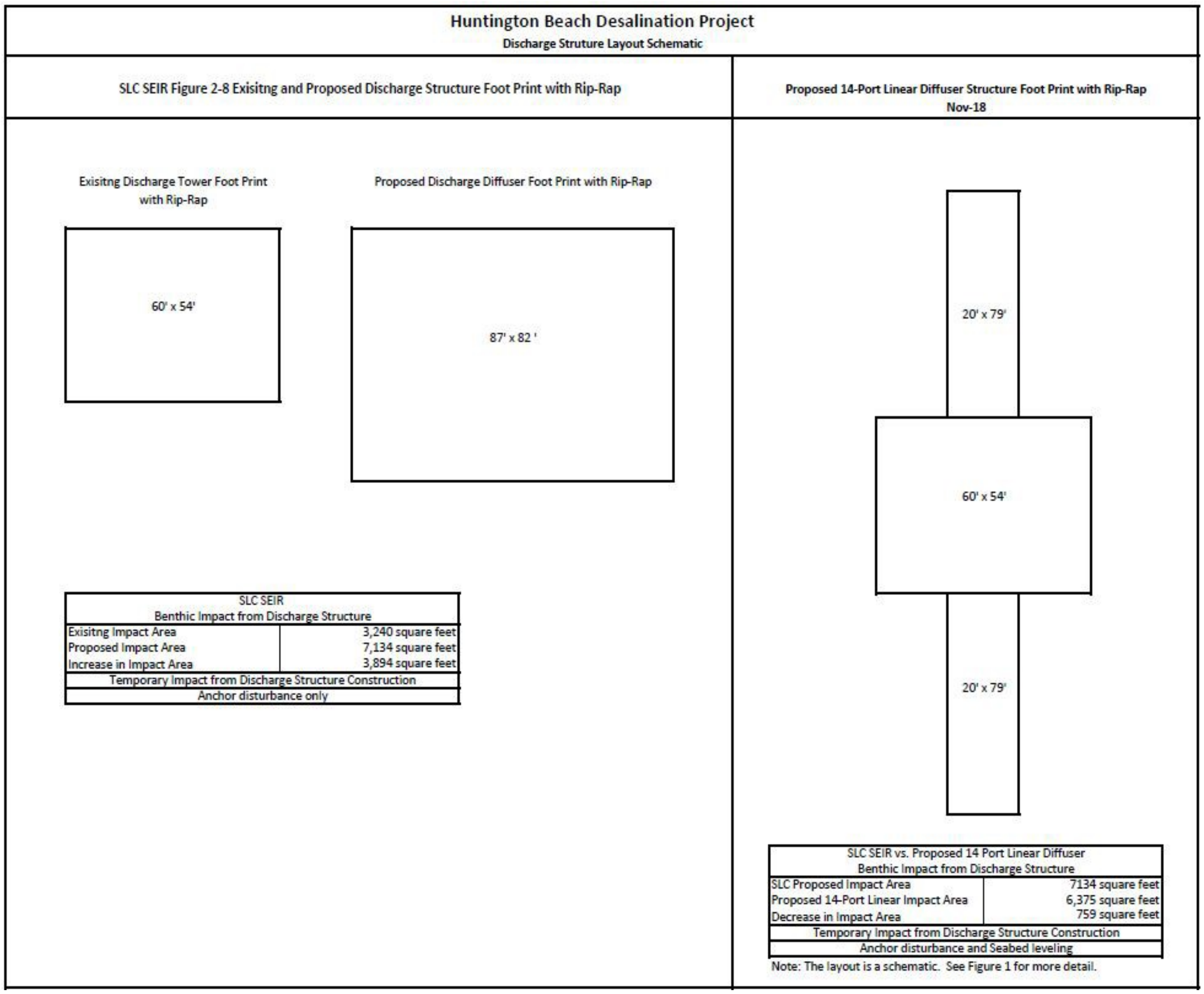


Figure 4. Revised benthic footprint from modified diffuser design. On the left is Figure 2, reproduced from above, and on the right is the revised footprint from Attachment 1

As stated in the *Huntington Beach Desalination Plant 2018 Diffuser Modifications Environmental Analysis* (Attachment 1, pp. 17–20), construction and installation of the modified diffuser would involve the following:

Construction Vessels

Construction of the modified diffuser would involve the same marine vessels operating at a similar frequency as analyzed in the 2017 FSEIR for the Lease Modification Project. As a result, construction of the modified diffuser would entail use of the same set of construction vessels as analyzed in the 2017 FSEIR.

Crew and supply vessels would be operated the same as analyzed in the 2017 FSEIR, traveling from the Port of Long Beach or closer harbors (e.g., Newport Harbor, Los Alamitos) to the construction area. This includes boats used to shuttle workers between the port and work site daily, with additional trips that may be needed to deliver equipment and supplies.

Anchoring

Similar to In the same manner as required for the 2017 duckbill diffuser the Lease Modification Project analyzed in the 2017 FSEIR, anchoring is required for the modified diffuser to ensure that the construction barge remains stationary. An Anchoring, Riprap Reconfiguration, and Dredging Plan and Preclusion Area Map (Anchoring Plan) was required as an Applicant Proposed Measures (APM) in the Lease Modification Project in the 2017 FSEIR, and the same Anchoring Plan would similarly be required for the modified diffuser to address the potential impacts associated with the anchoring of the construction barge tugboat. The Anchoring Plan will must identify and map all areas of kelp, seagrasses, and hard substrate found within the work area, which shall not be impacted by anchors, dragging anchor or buoy lines or cables, riprap, or leveling during construction and maintenance.

Riprap Reconfiguration

Installation of the new modified diffuser will require moving and reconfiguring the existing riprap around the seaward and shoreward sides of the existing discharge tower. The riprap that currently surrounds the existing discharge tower would first be side cast using a clam shell crane bucket from the derrick barge and later replaced around the new linear modified diffuser after installation. It is estimated that approximately 600 cubic yards of additional riprap may be needed to stabilize the new linear modified diffuser that was not previously analyzed in the 2017 FSEIR. It is assumed this The riprap would be transported from the Port of Long Beach by a single barge and tugboat near the end of diffuser installation, resulting in one additional tugboat trip that was not analyzed in the 2017 FSEIR.

As part of the Lease Modification Project analyzed in the 2017 FSEIR, implementation of a Turbidity Minimization and Monitoring Plan as an APM would be required to address turbidity that would be generated during sea floor levelling and riprap reconfiguration. This APM would similarly apply to these same aspects of construction of the new linear modified diffuser and will be required for construction of the linear diffuser.

Installation of the Diffuser

The modified diffuser would be installed prior to, or concurrently with, the wedgewire screen intake, as analyzed for the Lease Modification Project in the 2017 FSEIR. The diffuser system would be installed from an anchored derrick barge with a barge-mounted crane, moored above the tower during construction. Offshore work would be confined to the area in the near vicinity of the existing discharge tower. Construction would take 1 to 2 months with work hours limited to between 7 a.m. and 6 p.m. to adhere to the City's Municipal Code. Public access to the offshore work area (about 1,500 feet offshore) would be prohibited during installation of the modified diffuser.

Personnel access would be provided on a daily basis by an approximately 77- foot-long utility boat. Onshore support vehicles at the selected port would be the same as those analyzed for construction of the Lease Modification Project in the 2017 FSEIR and may include pick-up trucks, forklift, crane, and wheel loader.

Construction crews and vessels would vary depending on the scope of work occurring each day, but would be the same as those analyzed for the Lease Modification Project in the 2017 FSEIR:

- A day with lower activity levels would likely require approximately 13 crew members: 10 for the utility boat and three for a smaller (approximately 20 feet long) monitoring boat for marine mammal and turbidity monitoring.
- A day with higher activity levels may require as many as 23 crew members: 16 for a derrick barge; four for a tugboat; and three for the monitoring boat.

Installation of the diffuser may occur before, or concurrently with, the wedgewire screen intake installation. In either case, a similar set of vessels and crew will be required as analyzed in the 2017 FSEIR.

The following steps describe the construction approach to install the new linear modified diffuser:

1. The riprap on the seaward and shoreward sides of the existing concrete discharge tower would be removed and side-cast using a clam shell crane bucket from the derrick barge for reuse.
2. An area approximately 226 feet by 20 feet, including a portion of the existing discharge tower riprap area, would be leveled for placement of the diffuser. The leveling process would entail the removal of marine sediments. The material removed would be side-cast and would be redistributed by natural ocean currents or, if not naturally redistributed, towed to the Port of Long Beach. as described in the 2017 FSEIR.
3. A hole would be cut into the seaward and the shoreward sides of the existing concrete discharge tower (approximately 6 feet in diameter). Concrete pieces from the holes would be placed on the deck of the barge and would be disposed of in an appropriate land-based facility.
4. Concrete saddles would be positioned in the leveled area.
5. The new linear modified diffuser would be placed on the concrete saddles using the derrick barge.
6. Anchor straps or other similar methods would secure the new linear modified diffuser.
7. The annulus between the diffuser headers and the pre-cut holes in the existing concrete discharge tower will be filled using a pourback (underwater formwork and concrete pumped into the forms from the barge) or by using grout bags.
8. The side-cast riprap would be replaced, and additional riprap would be imported and then placed around the structure for scour protection.
9. The existing screen on top of the existing discharge tower would be removed and replaced with a concrete cap that would be secured to the existing concrete discharge tower.

(Dudek Analysis (2018), pp. 17–20 Appendix BBBBB2.)

The construction schedule for the modified diffuser will change slightly from what was analyzed in the 2017 FSEIR because the new design requires additional riprap material. Tables 1 and 2 shows the construction phases and sub-phases proposed as part of the 2017 FSEIR and identifies when the additional riprap for the modified diffuser would be transported via tugboat under the construction schedule. The construction subphases represent the modeling scenarios in the 2017 FSEIR. As shown in Tables 1 and 2, all dredging—including the transport of any dredged sediments that are not naturally redistributed—will be completed *prior* to the installation of the modified diffuser and wedgewire screens. The additional riprap needed for the modified diffuser would be transported by tugboat during the wedgewire intake screen and diffuser installation phase. As such, the additional tugboat trip needed to transport the additional riprap for the linear diffuser would not overlap with the transport of dredged sediments.

Table 1

2017 FSEIR Construction Phases	Construction Subphases
Demolition	First Day
	Remaining Days
	Last Day
Dredging	First Day
	Remaining Days
	Last Day (Any transport of dredged sediments would occur on this day)
Wedgewire Intake Screens and Diffuser Installation	First Day
	Remaining Days (Additional riprap transport for modified diffuser would occur on one day during this phase)
	Last Day

Table 1: 2017 FSEIR construction phases and the modified diffuser design adjustments.

Table 2

Construction Phase	Subphase	Worker Round Trips	Haul Truck Round Trips	Marine Vessels	Construction Equipment
Demolition	First day	23	0	1 tugboat for barge	1 crane on barge
				1 crew boat	1 electric underwater rivet buster and diamond saw
	Remaining days (estimates	13	0	1 work boat	1 crane on barge
				1 crew	1 electric

	are per day)			boat	underwater rivet buster and diamond saw
	Last Day	23	0	1 tugboat for barge	1 crane on barge
				1 crew boat	1 electric underwater rivet buster and diamond saw
Wedgewire Screen and Diffuser Dredging[1]	First day	23	0	1 tugboat for barge	1 crane on barge
				1 crew boat	
	Remaining days (estimates are per day)	13	0	1 work boat	1 crane on barge
				1 crew boat	
	Last day	23	63	1 tugboat for barge	1 crane on barge
				1 crew boat	1 Port of Long Beach crane and loader
Wedgewire Intake Screens and Diffuser Installation[1]	First day	46	5	1 tugboat for barge	2 cranes on barge
				1 crew boat	2 Port of Long Beach cranes
				1 work boat	1 Port of Long Beach forklift
	Remaining days (estimates are per day)	26	0	1 work boat	2 cranes on barge
				1 crew boat	

	Additional riprap transport for new diffuser (same day as Remaining days above)	4	38	1 tugboat for barge	1 crane on barge
	Last day	46	0	1 tugboat for barge 1 crew boat	2 cranes on barge

Table 2: 2017 FSEIR and modified diffuser design construction schedule.
[1] Under the construction schedule, the dredging will not occur on the same day as the installation of the wedgewire screens and diffuser. The dredging phase includes the transportation of dredged sediments to shore and onshore, and the installation phase includes the tugboat trip to transport additional riprap.

The operation of the modified diffuser will have similar impacts to the operation of the 2017 duckbill diffuser and, importantly, will substantially reduce impacts to marine life. Specifically, the modified diffuser design will result in a greater reduction in shearing-related mortality as compared to the 2017 duckbill diffuser design analyzed in the 2017 FSEIR. The Roberts Diffuser Design Report discussed a methodology to determine the best available diffuser design to minimize shearing-related mortality. The Roberts HB Diffuser Report applied that methodology to Poseidon Water's 2017 duckbill diffuser design and provided guidance regarding how to revise the diffuser design to better minimize shearing-related mortality. As noted in the 2017 FSEIR, shearing-related mortality from the 2017 duckbill diffuser design could occur in 782 MGD of feed water. By applying Dr. Robert's methodology, and redesigning the diffuser, shearing-related mortality was calculated as affecting only 168 MGD. By discharging through multiple ports at a different velocity, the modified diffuser will significantly reduce shearing-related mortality.

The maintenance for the modified diffuser will be of the same type and frequency as analyzed for the 2017 duckbill diffuser design: quarterly dives to inspect and clean the diffuser surfaces and periodic removal of biofouling as needed. The dive trips would require the use of a crew boat and each dive trip is not anticipated to exceed one day.

Environmental Impact Analysis

This Addendum evaluates the potential for the installation, maintenance, and operation of the modified diffuser to result in new or substantially greater significant environmental effects when compared to the impacts disclosed for the previous diffuser analyzed in the 2017 FSEIR. Poseidon Water engaged Dudek to conduct an environmental analysis that evaluates the potential for new significant or substantially more severe environmental impacts associated with changes to the diffuser design, installation, maintenance, and operation, compared to the Lease Modification Project previously analyzed in the 2017 FSEIR and, where applicable, to the Project analyzed in the 2010 FSEIR. Attachments 1–4 contain the complete analysis.

Dudek evaluated the potential impacts of installing the modified diffuser on the following topics:

- Air Quality
- Marine Biological Resources
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Noise
- Recreation
- Marine Transportation

The Santa Ana Water Board reviewed Dudek's analysis and independently concluded that the modified diffuser will not result in new or substantially greater significant environmental effects when compared to the impacts disclosed for the 2017 duckbill diffuser analyzed in the 2017 FSEIR. In addition to the topics considered in the Dudek analysis, the Santa Ana Water Board also considered potential impacts to tribal cultural resources. Topics not included in the analysis, including cumulative impacts, were not different than the impacts identified in the 2010 FSEIR and 2017 FSEIR. The Santa Ana Water Board is not aware of new projects in the area that were not analyzed in the 2010 FSEIR or the 2017 FSEIR that would require additional analysis to assess cumulative impacts.

Air Quality

Previous Environmental Analysis

The 2017 FSEIR analyzed the air quality impacts related to the construction, the installation and the operation and maintenance of wedgewire screens and the 2017 duckbill diffuser. The emissions of criteria pollutants were quantified based on the anticipated construction schedule, activity, and construction equipment that would be used. The equipment was split into two categories: the primary equipment used to load the construction barge at the port and the offshore equipment. At the Port of Long Beach, construction activities would require use of a forklift, worker vehicles, off-site haul trucks, wheel loaders, and a crane. Offshore activities would require use of a work boat or utility boat, tugboat, and a crew boat. The analysis in the 2017 FSEIR used the California Emissions Estimator Model (CalEEMod) Version 2016.3.1 to estimate emissions from these vehicles, and then compared the estimates to the air pollutant thresholds recommended by the South Coast Air Quality Management District (SCAQMD).

The table below shows the results for the comparison of the Lease Modification

Project's pollutant emissions to the SCAQMD thresholds from the 2017 FSEIR. The 2017 FSEIR provided data for the emissions attributable to the construction, operation, and maintenance of the wedgewire screen and the 2017 diffuser design. The 2017 FSEIR calculated the maximum construction emissions based on the assumption that the installation of the intake screen and the 2017 diffuser would occur on the last day of dredging. As seen in the table below, most of the values were below the daily thresholds (in pounds per day). The only value that was near the limit was the NO_x emissions associated with the daily construction of the intake screen and the 2017 duckbill diffuser, dredging, and sediment transport.

Table 4.3.2. SCAQMD Thresholds and Estimated Emissions

SCAQMD Thresholds						
	NO_x	VOC	PM_{10}	$PM_{2.5}$	CO	SO_x
Regional daily construction-phase activity thresholds	100	75	150	55	550	150
Regional daily operation-related activity thresholds	55	55	150	55	550	150
Localized Significance Threshold (at 500 m)	219	–	135	76	–	–
Lease Modification Project Daily Maximum Construction-Phase Emissions						
Screen and Diffuser Construction	73.85	6.71	4.26	2.13	34.52	0.15
Lease Modification Project Daily Maximum Operation and Maintenance Emissions						
Screen and Diffuser O & M	6.38	1.16	0.29	0.22	5.19	0.01

Source: SCAQMD (2015); Dudek (2017)
Notes: All measurements in pounds per day (lb/day)
Acronyms: "—" = no applicable threshold, m = meter, CO= carbon monoxide, NO_x = nitrogen oxides, PM = particulate matter, $PM_{2.5}$ = PM less than 2.5 microns in diameter, PM_{10} = PM less than 10 microns in diameter, SO_x = sulfur oxides, VOC = volatile organic compound.

Table 3: This table shows regional criteria air pollutant data only and is reproduced from the 2017 FSEIR.

Although the NOx emissions on the last day of dredging and the construction of the intake screens and diffuser (73.85 lb./day) alone would not exceed the SCAQMD threshold, the analysis in the 2017 FSEIR concluded that the additional emissions would worsen the significant and unavoidable impact of NOx emissions related to the construction of the onshore facility identified in the 2010 FSEIR. Thus, the 2017 FSEIR determined the offshore construction impacts would result in a greater impact than analyzed in the 2010 FSEIR and the impact would remain significant and unavoidable. Due to increased NOx from the construction of the Lease Modification Project, the analysis in the 2017 FSEIR also concluded that there would be a significant and unavoidable cumulative impact to air quality in the region. The cumulative short-term impact finding was based on the addition of emissions from the Lease Modification Project to emissions from other projects in SCAQMD. If these other projects in SCAQMD occur during a similar construction timeframe as the Project, together they would create a short-term localized impact.

The 2017 FSEIR also found that there would be an exceedance of the localized significance thresholds for SCAQMD related to construction for PM_{10} and $PM_{2.5}$ (Attachment 1).

The 2017 FSEIR concluded that operation and maintenance of the 2017 duckbill diffuser would not contribute to significant air quality impacts. Routine inspections for maintenance would be conducted by a dive team. When dive teams are periodically needed, their transportation in both vehicles onsite and the crew boat would not result in emissions that would cause significant impacts.

Modified Diffuser

The construction process for the modified diffuser would use the same vehicles and methods of transportation for the equipment as used for the 2017 duckbill diffuser design. The modified diffuser design will also be installed by an anchored barge with a barge mounted crane (Attachment 1). However, the construction of the modified diffuser will not use the same amount of materials. The modification of the riprap coverage for the modified diffuser requires 600 cubic yards of additional riprap. The additional riprap would be transported on a barge towed by a tugboat, resulting in one more tugboat trip than analyzed for the 2017 duckbill diffuser. (Attachment 2.)

The additional tugboat trip for riprap transport will occur on one of the remaining days in the wedgewire intake screen and diffuser installation phase, after the dredging phase and after any transport of dredged sediments (See Table 2). Thus, the air emissions from the additional tugboat trip will not occur on the last day of dredging, the day on which maximum emissions would occur in the 2017 FSEIR. The calculation of the maximum emissions for the changes to the diffuser assumes that the installation of the wedgewire screens and the installation of the diffuser will occur simultaneously. To determine the maximum emissions for the changes to the diffuser, the emissions from the additional tugboat trip were added to the daily construction emissions for the installation of the wedgewire intake screens and diffuser as calculated in the 2017 FSEIR. It is appropriate to use these daily construction emissions from the 2017 FSEIR because the installation of the modified diffuser will use and operate the same equipment as the 2017 duckbill diffuser.

Table 4

	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Additional Emissions from One Tugboat Trip for Riprap Transport and Associated Haul Truck Trips for Modified Diffuser Installation[1]	1.95	20.35	10.22	0.04	1.09	0.54
Wedgewire Intake Screens and Diffuser Installation (Remaining Days) Construction Emissions from 2017 FSEIR [2]	3.22	19.70	15.14	0.02	1.26	0.80
Maximum Emissions for Modified Diffuser Modifications (Sum of Row 1 and Row 2)	5.17	40.05	25.36	0.06	2.35	1.34
Maximum Emissions from 2017 FSEIR (Last Day of	*6.71*	*73.85*	*34.52*	*0.15*	*4.26*	*2.13*

Dredging - – Lease Modification Project (For Comparison Only) [3]						
SCAQMD Threshold	*75*	*100*	*550*	*150*	*150*	*55*
Threshold or 2017 FSEIR Emissions Exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

Table 4. This table shows revised air emissions associated with the new diffuser design. It is reproduced from Attachment 1, where it is table 1.

Notes: [1] Assumes one additional tugboat and barge roundtrip from the Port of Long Beach and 38 haul truck roundtrips. A typical barge has a capacity of 1,750 tons (U.S. ACOE 2018). Assuming that riprap has a density of approximately 2 tons to 2.36 tons per cubic yard, the additional riprap import required for the diffuser modifications would be approximately 1,200 tons to 1,416 tons, respectively. Therefore, the additional riprap required for the diffuser modifications would be accommodated by one round trip from the Port of Long Beach by a tugboat and barge.

[2] Shows emissions analyzed for a normal workday during diffuser and wedgewire screen intake installation in the 2017 FSEIR. The installation of the modified diffuser will use and operate the same equipment as the installation of the 2017 duckbill diffuser, resulting in the same daily emissions as calculated in the 2017 FSEIR. (Source: Appendix A, 2017 FSEIR).

[3] Maximum daily construction emissions occurred on the last day of the dredging phase of construction of the Lease Modification Project in the 2017 FSEIR. (Source: Appendix A, 2017 FSEIR)

[4] Includes emissions from simultaneous construction of the wedgewire screen intake from the Lease Modification Project analyzed in the 2017 FSEIR.

The first row of Table 4 shows the additional emissions for the tugboat trip for riprap transport and associated haul truck trips. The second row shows the daily construction emissions for the wedgewire intake screen and diffuser installation as analyzed in the 2017 FSEIR. The third row shows the maximum emissions associated with the diffuser changes: the daily construction emissions for the installation of the wedgewire intake screens combined with emissions from the additional tugboat. The maximum construction emissions shown in the third row would be less than the maximum construction emissions in the 2017 FSEIR (the fourth row of Table 4) and less than the SCAQMD thresholds (the fifth row of Table 4).

The frequency and type of operation and maintenance would not change with the modified diffuser. However, the construction of the modified diffuser design would require approximately 200 to 300 cubic yards of ocean floor sediment to be side-cast due to dredging and leveling of the seabed; any material that is not redistributed would need to be transported for disposal at a land-based facility. Dredging and transportation of dredged materials was not needed for the previous diffuser design and thus associated criteria air pollutant emissions were not analyzed for the diffuser installation in the 2017 FSEIR. However, the additional dredging and transportation required for the diffuser modifications falls within the analysis for the range of emissions for wedgewire screen dredging activities in the 2017 FSEIR.

The 2017 FSEIR assumed that 1,000 to 3,300 cubic yards of material would be excavated and side-cast for the installation of the wedgewire screen. This estimate was conservative and overestimated the amount of excavated and side-casted materials associated with for the installation of the wedgewire screen. (Attachment 4.) Based on the preliminary design of the intake screens, the excavation quantity is estimated to be 2,700 cubic yards. (Attachment 4.) Given this estimated excavation quantity for the intake screens, the approximately 200 to 300 cubic yards of sediment that will need to be dredged and side-cast during construction of the modified diffuser is covered by the 2017 FSEIR analysis for dredging related to the installation of the wedgewire screens. (Attachment 4.) When added together, the estimated excavation quantity for the intake screens (2,700 cubic yards) and the modified diffuser (200 to 300 cubic yards) amounts to 2,900 to 3,000 cubic yards and is less than the 3,300 cubic yards analyzed for the intake screens in the 2017 FSEIR.

The derrick barge crane will excavate the sediment as outlined in the 2017 FSEIR. The modified diffuser design would not result in additional hours of operation of the derrick barge crane or exceed the emissions estimated in the 2017 FSEIR for the installation of the wedgewire screen and diffuser construction. Therefore, the construction, operation, and maintenance of the modified diffuser would not create a new significant impact nor cause a substantially more severe impact on air quality than those analyzed in the 2017 FSEIR.

<u>Marine Biological Resources</u>

Previous Environmental Analysis

The 2017 FSEIR found that the impacts to special status species populations associated with the installation of the 2017 duckbill diffuser design would be less than significant. The 2017 duckbill diffuser construction would disturb species because of the riprap reconfiguration, noise, and construction vessels used. However, the construction would only temporarily disturb special-status species that are present in the area, and the short-term disturbance would have negligible effects on the affected species. Additionally, the impacts would be minimized by APMs requiring a spill prevention and response plan, worker educational training, sensitive marine species monitoring, and implementation of best management practices (BMPs) to protect marine biological resources.

The 2017 FSEIR also found that the construction of the 2017 duckbill diffuser has the potential to introduce invasive and non-native species into the waters because the Lease Modification Project would require the use of several types of marine vessels to transport the diffuser equipment. The primary way that non-native species may be introduced is through boat traffic and ballast water discharges. The 2017 FSEIR required mitigation measures to reduce the potentially significant impacts resulting from the spread of invasive non-native species to less than significant.

The 2017 FSEIR found that the impacts to special species resulting from the operation of the diffuser would be less than significant with mitigation. The 2017 FSEIR identified Mitigation Measure OWQ/MB-7, which requires Poseidon Water to develop and implement a diffuser-operation marine life mitigation plan in consultation with the public agencies with jurisdiction and responsibility for minimizing and compensating for marine life mortality.

Modified Diffuser

The construction, operation, and maintenance impacts to marine biological resources associated with the modified diffuser would not create a new or more severe impact different from those identified in the 2017 FSEIR. The construction and installation of the modified diffuser would require the use of the same construction vessels from the Port of Long Beach and the same equipment, and would occur at the same site analyzed for the 2017 duckbill diffuser in the 2017 FSEIR.

The addition of more riprap for the new design, could result in temporary disturbance to benthic marine species; however, the impacts are less than significant and are the same impacts as those analyzed in the 2017 FSEIR. Importantly, the operation of the modified diffuser will result in a significant reduction of marine organism entrainment due to shear stress. The estimated flow exposed to shearing-related mortality for the modified diffuser is 168 MGD (Roberts HB Diffuser Report). This is notably lower than the potentially exposed flow associated with the 2017 duckbill diffuser analyzed in the 2017 FSEIR: 782 MGD. Thus, marine life mortality due to shear stress will be lower with the modified diffuser.

Permanent benthic impacts will also be less than those identified in the 2017 FSEIR. The total area of the 2017 duckbill diffuser design was 7,134 square feet, whereas the total area for the modified diffuser design is 6,375 square feet, thus resulting in a benthic footprint that is 759 square feet smaller. (See Figure 4 above.) Therefore, construction, operation, and maintenance of the modified diffuser would not create a new significant impact nor cause a substantially more severe impact on marine biological resources than those analyzed in the 2017 FSEIR.

<u>Greenhouse Gas (GHG) Emissions</u>

Previous Environmental Analysis

The 2017 FSEIR concluded that construction of the 2017 duckbill diffuser design would result in less than significant GHG emissions impacts. Poseidon Water originally estimated that the separate "construction only" GHG emissions for the diffuser and offshore wedgewire screen were 72 MTCO2e (Appendix G, Table 1-Aggregrate 50-Year 2017). This GHG emissions output was considered separate from the other onshore construction equipment and travel calculations. These emissions would combine with the Project's onshore construction (822 MTCO2e) and the other off-site construction activities (1,233 MTCO2e). However, these emissions are short-term impacts that would cease after construction.

The routine operation of the Lease Modification Project would result in no more than 21 MTCO2e annually (2017 FSEIR, p. 4-128). Because this impact was to be offset by a required mitigation GHG plan, there would be no significant cumulative impact related to GHG impacts.

Both the construction and operation/maintenance quantities of GHG were lower than the threshold limit of 10,000 MTCO2e for SCAQMD (p. 4-125). Additionally, the 2017 FSEIR found that the Lease Modification Project would not conflict with applicable plans, policies or regulations for reducing GHG emissions.

Modified Diffuser

The modified diffuser design requires 600 additional cubic yards of riprap and requires additional haul trips for construction to complete installation, and thus results in an additional incremental increase of emissions. (Attachment 1). The riprap requires the following additional trips: approximately 26 haul truck round trips for the riprap transport onshore, and one tugboat round trip for offshore transport (Attachment 1). To calculate the emissions, increase from the transportation, Poseidon used the same methodology as the 2017 FSEIR (Emission Estimation Methodology for Commercial Harbor Craft Operating in California). The GHG emission results are in Table 5 below.

Table 5

Modifications	MT CO_2E	Amortized Annual Emissions
2017 FSEIR Diffuser and Offshore Wedgewire Screen Intake Emissions	71.64	1.43
Extra Construction Day for Modified Diffuser	4.21	0.08
Total	75.85	1.52

Table 5: Estimated Annual Construction GHG Emissions – Modified Diffuser. Source: Attachment 1 2018 Notes: MT = metric tons; CO2E = carbon dioxide equivalent; Emissions amortized over the 50-year project lifetime.

Although there would be a slight increase in GHG emissions, the potential impacts would be less than significant since they would not be significantly different than those analyzed in the 2017 FSEIR (Table 5). The small increment of change from 71.64 to 75.85 would not result in a significant long-term impact. The resulting increase does not exceed the SCAQMD threshold (10,000 MT CO2E per year) and would be 100% offset through implementation of the GHG Plan identified in the 2017 FSEIR. As such, construction, operation, and maintenance of the modified diffuser would not create a new significant impact nor cause a substantially more severe impact related to GHG emissions than those analyzed in the 2017 FSEIR.

Hydrology and Water Quality

Previous Environmental Analysis

The 2010 FSEIR found that the impacts on water quality associated with the construction of the onshore facility would be less than significant based on compliance with the 2006 NPDES permit for the facility and a stormwater pollution prevention plan, together with implementation of BMPs. The 2017 FSEIR analyzed construction impacts specific to the installation of the diffuser and found that it could have temporary impacts on water quality due to turbidity from anchoring and potential spills. The anchors from the marine vessels could decrease water clarity when the anchors are dragged on the sand and increase turbidity. Oil spills were considered a potential impact because of the construction vessel trips that carry the diffuser to the site. However, the 2017 FSEIR found that the construction and installation of the 2017 duckbill diffuser would not substantially degrade water quality because the construction would be short-term, and the impact would be minimized by APMs requiring turbidity minimization, spill response planning, and worker training. The installation of the 2017 diffuser did not require dredging and as such the 2017 FSEIR did not analyze dredging impacts related to the diffuser. However, the 2017 FSEIR analyzed the dredging and trench construction for the installation of the wedgewire screens, estimating that 1,000 to 3,300 cubic yards of soil would be excavated. During the installation of the wedgewire screens, the 2017 FSEIR determined that the dredging and trench construction would also create short term turbidity in the area.

The 2010 FSEIR analyzed impacts related to the operation of the discharge without a diffuser, and found that the discharge would have a less than significant impact because compliance with the requirements of the Project's 2006 NPDES permit limits would ensure that impacts related to elevated salinity would be less than significant. The 2006 NPDES permit required the discharge to meet receiving water limitations outside the zone of initial dilution, which was defined as the area extending 1,000 feet from the base of the discharge tower. Based on a 7.5:1 dilution factor, the salinity concentration of 40 parts per thousand (ppt) would not extend beyond the zone of initial dilution under those operating conditions.

The 2017 FSEIR analyzed the impacts of the operation of the diffuser and found that the operation of the discharge diffuser would help dilute the brine to less than 2.0 ppt above natural background salinity within 80 feet from the discharge point. The discharge would thus meet the receiving water limitation for salinity in the Ocean Plan, which requires that the discharge not exceed 2.0 ppt above natural background measured no further than 328 feet from the discharge point. As such, the 2017 FSEIR found that the impact to water quality associated with diffuser operation would be less than significant.

The 2017 FSEIR also analyzed the impacts of cleaning the wedgewire screens and found that the impacts would be less than significant with the implementation of APMs requiring the implementation of BMPs to protect water quality and a turbidity minimization and monitoring plan.

Modified Diffuser

The installation of the modified diffuser requires construction and dredging, and the reconfiguration and addition of riprap. These changes do not result in a new significant impact or a substantial increase in the severity of impacts related to water quality. The turbidity associated with anchoring and the risk of potential spill would be the same as analyzed for the diffuser analyzed in the 2017 FSEIR. The turbidity associated with dredging for construction of the linear diffuser falls within the potential impacts addressed in the 2017 FSEIR analysis for the dredging associated with the installation of the wedgewire screens. As discussed above, the 2017 FSEIR overestimated the amount of sediment that would be excavated for the screens and the excavation required for the modified diffuser is within that estimated volume. Finally, operational impacts will be less than those identified in the 2017 FSEIR because the modified diffuser will reduce the brine mixing zone (BMZ) radius from 79.7 feet to 63.2 feet. Therefore, construction, operation, and maintenance of the linear diffuser will not create a new significant impact nor cause a substantially more severe impact related to water quality than those impacts analyzed in the 2017 FSEIR and the 2010 FSEIR.

<u>Noise</u>

Previous Environmental Analysis

The 2017 FSEIR found that the noise impacts associated with the 2017 diffuser installation would be less than significant. Construction noise would occur at the site, which is 1,500 feet offshore. The noise associated with construction could impact onshore receptors and the marine species underwater. The onshore receptors that are closest to the construction and potentially affected would be the population at the Huntington by the Sea RV-park. If the intake screen and diffuser are installed at the same time, the combined noise level heard at this residency onshore could be up to 60 dBA. 60 dBA is below the significance threshold (65 dBA) set for this region by the City of Huntington Beach's Municipal Code, and therefore this combined noise level would be less than significant. The Lease Modification Project construction would increase the daytime noise levels, but the increase would be temporary and would fall below the threshold. The other noise concerns related to marine biological resources are addressed in the *Previous Environmental Analysis* section above for the Marine Biological Resources. Noise impacts may also result from the operation of marine vessels. The boats used in construction of the Lease Modification Project, both for the crew and equipment, do not produce different or higher sound levels than the routine traffic in the affected waters and related noise impacts are therefore less than significant. The vessels and equipment used in routine operation and maintenance (e.g. air bursting for cleaning) of the diffuser were also assessed. Cleaning the diffuser does not produce a significant noise level or impact to marine species.

Modified Diffuser

Noise impacts associated with the installation and operation of the modified diffuser are the same as those analyzed for the 2017 duckbill diffuser design because the modified diffuser would use the same methods of transportation during construction and the same offshore site (Attachment 1.) The modified diffuser would not create a new significant impact because the noise generated would fall under the worst-case scenario analyzed for the installation of the 2017 duckbill diffuser analyzed in the 2017 FSEIR. The noise levels would be the same because the same noise-generating equipment required for the 2017 duckbill diffuser design will be used for the modified diffuser. The resulting maximum noise level would also be at the same distance from sensitive onshore receptors analyzed in the 2017 FSEIR and would have the same impact; therefore construction, operation, and maintenance of the linear diffuser will not create a new significant impact nor cause a substantially more severe impact related to noise than analyzed in the 2017 FSEIR.

<u>Recreation</u>

Previous Environmental Analysis

The 2017 FSEIR analyzed impacts to recreation related to installation and operation of the diffuser. The significance criteria for this impact was based on whether the Lease

Modification Project would prevent access to recreational sites or disturb users of the recreational facilities during times of peak use. The use of barge and vessels for offshore construction of the diffuser and for diffuser maintenance could prevent access to offshore recreational areas during peak use, but the 2017 FSEIR found that the impacts would be less than significant. The 2017 duckbill diffuser construction was estimated to take up to 2 months and would occur during the hours of 7 a.m. to 6 p.m. During this timeframe, the recreational activities potentially affected are fishing, boating, and diving. The public would be temporarily prevented from conducting these activities at those times when construction is happening. Similarly, impacts from routine maintenance of the diffuser would be temporary and less than significant.

Modified Diffuser
Impacts to recreation due to installation and operation of the modified diffuser would be the same as those identified in the 2017 FSEIR. Even though the construction process would include more vessel trips offshore, there would be no further impact to recreational activities. There would be no further impact because these trips would occur within the 2017 planned construction timeline. Because the trips occur during the timeline, they would be occurring on the same days that limit access to the area. Therefore, the limited public access for recreational activities would not occur for longer than the time specified in the 2017 FSEIR. The impact would be the same in time and space and is therefore less than significant.

<u>Marine Transportation</u>

Previous Environmental Analysis
The 2017 FSEIR analyzed offshore construction activities related to construction of the 2017 duckbill diffuser design and the associated potential impacts to marine transportation. The construction of the 2017 duckbill diffuser would have used construction vessels from the Port of Long Beach. The marine transportation impacts significance threshold used in the 2017 FSEIR for offshore projects was based on whether the Lease Modification Project would reduce the existing level of safety for navigating vessels or increase the potential for marine vessel accidents. The construction of the 2017 duckbill diffuser would not have been likely to do either. The number of vessels used to transport the diffuser to the construction area is small compared to the existing calls and marine traffic at the Port of Long Beach. The daily operation of the Port of Long Beach serves numerous vessels each day and the few additional vessels used for the Lease Modification Project would not produce a cumulative marine traffic impact. The vessels would also be stationary surrounding the area where the screen intake and diffuser would be installed, thus decreasing the risk of traffic and collisions. Vessel routes for the transportation of equipment for the 2017 duckbill diffuser are likely to look the same on a day-to-day basis because they originate and end at the same port making them safer and predictable. The vessels also would not remain offshore overnight. During offshore travel days the vessels carrying the 2017 duckbill diffuser would report their travel plans to the U.S. Coast Guard. They would also send their travel report out via publication of a Local Notice to Mariners. If the construction team consistently follows these protocols, then the safety criteria would be

met, and the vessels would not result in a significant impact related to marine transportation. The 2017 duckbill diffuser would be installed at a depth that would not cause any obstruction to marine vessels en route.

Modified Diffuser
Potential impacts to marine transportation were found to be less than significant in the 2017 FSEIR and are less than significant for the modified design (Attachment 1). The additional round trip of the tugboat and barge for riprap is not likely to substantially reduce the existing safety level of marine transportation in and around the Port of Long Beach or the construction area. The additional vessel trips will follow the same mitigation procedures as described in the 2017 FSEIR and report all transportation plans to U.S. Coast Guard and via publication of a Local Notice to Mariners. Offshore construction activities of the modified diffuser would also be subject to the same U.S. Coast Guard public notice requirements established in the 2017 FSEIR.

Daily operation of the modified diffuser would also not impact marine transportation. After construction is completed, the top of the modified diffuser would be submerged at the same or lower depth than the existing discharge tower on the HBGS discharge pipeline thereby allowing sufficient deep for typical marine vessels in the area to navigate the site (see Section 4.10 of the 2017 FSEIR). Therefore, installation of the modified diffuser would result in a less than significant impact to obstruction of marine vessel traffic.

Tribal Cultural Resources

Previous Environmental Analysis
The 2010 FSEIR included a cultural resources assessment and indicated that the Native American Heritage Commission (NAHC) Sacred Lands File search did not indicate any tribal cultural resources in the immediate area of the Project as proposed in 2010. The 2017 FSEIR analyzed impacts to tribal cultural resources associated with the offshore construction of the intake and discharge modifications. The State Lands Commission submitted a Sacred Lands File search request to the NAHC; the response from NAHC indicated no known presence of tribal cultural resources in the immediate Lease Modification Project area. The State Lands Commission also sent outreach letters to the Gabrielino-Tongva Tribe, Gabrielino Tongva Indians of California Tribal Council, Gabrielino/Tongva Nation, Gabrielino/Tongva San Gabriel Band of Mission Indians, and the Gabrielino Band of Mission Indians–Kizh Nation. The State Lands Commission did not receive responses from any of the tribes.

Modified Diffuser
The modification to the diffuser design did not change the general Project area, so the NAHC Sacred Lands File search response indicating no known presence of tribal cultural resources in the immediate Lease Modification Project area remains applicable.

Consistent with the State Water Resources Control Board Tribal Policy, the Santa Ana Water Board did send outreach letters to the Gabrielino-Tongva Tribe, Gabrielino Tongva Indians of California Tribal Council, Gabrielino/Tongva Nation, Gabrielino/Tongva San Gabriel Band of Mission Indians, and the Gabrielino Band of Mission Indians–Kizh Nation on October 2, 2019. The outreach letters included a description of the changes to the diffuser design and provided the tribes with an opportunity to consult with the Santa Ana Water Board regarding the potential impact the proposed diffuser modifications could have on tribal cultural resources. The Santa Ana Water Board did not receive any responses from the tribes. Therefore, construction, operation, and maintenance of the linear diffuser will not create a new significant impact nor cause a substantially more severe impact related to tribal cultural resources than analyzed in the 2017 FSEIR.

Conclusion
As discussed above, the construction, operation, and maintenance of the modified diffuser would not create any new significant impacts and would not result in a substantial increase in the severity of impacts identified in the 2010 FSEIR or the 2017 FSEIR.

References:

Alden Research Laboratory, Inc. (Alden). 2018. Linear Diffuser Optimization and Design for Poseidon's Huntington Beach Desalination Plant. Technical Memorandum. Prepared for Poseidon Water, July 2018.

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Alden Research Laboratory, Inc. (Alden). 2018. Linear Diffuser Optimization and Design for Poseidon's Huntington Beach Desalination Plant. Technical Memorandum. Prepared for Poseidon Water, July 2018 (Appendix BBBBB5 to Poseidon Water's Request for a Water Code Section 13142.5(b) Determination).

Attachment 1

DUDEK

MAIN OFFICE
605 THIRD STREET
ENCINITAS, CALIFORNIA 92024
T 760.942.5147 T 800.450.1818 F 760.632.0164

HUNTINGTON BEACH DESALINATION PLANT 2018 DIFFUSER MODIFICATIONS ENVIRONMENTAL ANALYSIS

To:	Josie McKinley, Poseidon Water
From:	Joe Monaco, Dudek Austin Melcher, Dudek Caitlin Munson, Dudek
Subject:	Huntington Beach Desalination Plant 2018 Diffuser Modifications Environmental Analysis
Date:	November 27, 2018
Attachment(s):	Appendix A: Air Quality and Greenhouse Gas Calculations Appendix B: Figures

1 INTRODUCTION AND BACKGROUND

The Santa Ana Regional Water Quality Control Board ("Regional Board") has requested that Poseidon consider redesigning the proposed brine diffuser based on the analysis found in an April 18, 2018 report entitled Brine Diffusers and Shear Mortality: Application to Huntington Beach prepared by Philip J. W Roberts, PhD, PE. On August 3, 2018, Poseidon submitted the diffuser modification designs. On September 25, 2018, the Regional Board received a letter from the California State Lands Commission (Commission) concerning the revised diffuser design. The Supplemental EIR evaluated a diffuser design that placed the three ports on top of the existing outfall tower and expanded the riprap footprint around the structure. This design fell within the existing Commission lease area. Commission staff understands that the new diffuser design will set the linear diffuser away from the existing outfall tower. In response to the Commission staff's inquiry, Poseidon has re-aligned the 14-port linear diffuser with the existing tower which lies within the lease area.

This analysis evaluates the potential for new significant or substantially more severe environmental impacts pursuant to the California Environmental Quality Act (CEQA) (Section 15162) and associated with changes to the Huntington Beach Desalination Plant's (HBDP's) diffuser compared to the Lease Modification Project previously analyzed in the Final Supplemental EIR for the Poseidon HBDP (2017 Supplemental EIR) approved by the California State Lands Commission (Commission or CSLC) in 2017 and, where applicable, to the HBDP analyzed in the Subsequent Environmental Impact Report (2010 Subsequent EIR) for the Seawater

Desalination Project at Huntington Beach approved by the City of Huntington Beach in 2010. This analysis evaluates the new linear diffuser on the following topics:

- Air Quality
- Marine Biology
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Noise
- Recreation
- Marine Transportation

Any topics not included in this analysis would not be substantially different than the impacts identified in the 2017 Supplemental EIR and the 2010 Subsequent EIR.

2 PROJECT DESCRIPTION

Diffuser Design Modifications

The new 14-port diffuser design would incorporate 2 7-port linear diffuser sections connected to the seaward and shoreward sides of the existing discharge tower. The linear diffuser would consist of a 4-foot diameter pipe header equipped with fourteen (14) duck-bill type check valves (ports). The new linear diffuser would be placed directly on the seabed on concrete pipe saddles that would secure the pipe. Riprap would be placed around the pipes to avoid scour under the diffuser. The linear diffuser would be oriented perpendicular to the shore to minimize wave loading forces on the diffuser. The existing discharge tower and the 14-port linear diffuser would be approximately 208 feet long. The existing discharge tower, the linear diffuser and the riprap area will be approximately 226 feet long. See Figure 1 – Preliminary Brine Discharge Linear Diffuser.

The existing concrete discharge tower (approximately 25 feet x 20 feet) is surrounded by riprap on all sides which extends approximately 20 feet from the existing concrete tower. The riprap on the seaward and shoreward sides of the existing structure would be removed and side-cast away from the structure and would be later re-used for scour protection. After the riprap is removed, approximately 200 to 300 cubic yards of the seabed will be levelled. Excess material will be side-cast. As stated in the 2017 Supplemental EIR, any excavated suspended sediments would be redistributed by ocean currents. A 5 to 6 foot hole will then be cut into the seaward and shoreward sides of the tower using a combination of core drilling and wire sawing. The existing screen on top of the existing concrete structure would be removed and replaced with a solid concrete cap that will be secured to the existing concrete tower.

Concrete saddles will then be placed on both sides of the tower, in the areas that were levelled to secure the linear diffuser. The linear diffuser would be pre-assembled and would be placed using a derrick barge in onto the saddles. The linear diffuser would then be placed through the holes in the existing concrete structure. The void between the outside of the diffuser header and the existing concrete structure would be filled using concrete (either by forming a pourback with underwater forms or by placement of grout bags. The linear diffuser would then be secured to the concrete saddles using saddle anchor straps or concrete anchor blocks. The side-casted riprap would then be replaced around the linear diffuser.

The linear diffuser riprap area would occupy an area of approximately 226 feet by 20 feet, including a portion of the existing discharge tower riprap area, and would also require temporary removal of the riprap on two sides of the existing discharge tower (which would be reused to protect the structure). This would result in a decrease in the area footprint (including the protective riprap) of approximately 759 square feet from approximately 7,134 square feet for the Lease Modification Project diffuser footprint analyzed in the 2017 Supplemental EIR to approximately 6375 square feet footprint for the new linear diffuser, existing discharge tower and riprap area. See Figure 2 - Huntington Beach Desalination Project Discharge Structure Layout Schematic.

Construction Vessels

Construction of the new linear diffuser would involve the same marine vessels operating at a similar frequency as analyzed in the 2017 Supplemental EIR for the Lease Modification Project. As a result, construction of the new linear diffuser would entail use of a similar set of construction vessels as analyzed in the 2017 Supplemental EIR.

Crew and supply vessels would be operated the same as analyzed in the 2017 Supplemental EIR, traveling from the Port of Long Beach or closer harbors (e.g., Newport Harbor, Los Alamitos) to the construction area. This includes boats used to shuttle workers between the port and work site daily, with additional trips may be needed to deliver equipment and supplies.

Anchoring

Similar to the Lease Modification Project analyzed in the 2017 Supplemental EIR, anchoring is required to ensure that the construction barge remain stationary. An Anchoring, Riprap Reconfiguration, and Dredging Plan and Preclusion Area Map (Anchoring Plan) was required as an Applicant Proposed Measures (APM) in the Lease Modification Project in the 2017 Supplemental EIR and would similarly be required to address the potential anchoring of the tugboat. The Anchoring Plan will identify and map all areas of kelp, seagrasses, and hard substrate found within the work area, which shall not be impacted by anchors, dragging anchor or buoy lines or cables, riprap, or leveling during construction and maintenance.

Riprap Reconfiguration

Installation of the new diffuser will require moving and reconfiguring the existing riprap around the seaward and shoreward sides of the existing discharge tower. The riprap that currently surrounds the existing discharge tower would first be side-cast using a clam shell crane bucket from the derrick barge and later replaced around the new linear diffuser after installation. It is estimated that approximately 600 cubic yards of additional riprap may be needed to stabilize the new linear diffuser that was not previously analyzed in the 2017 Supplemental EIR. It is assumed this riprap would be transported from the Port of Long Beach by a single barge and tugboat near the end of diffuser installation.

As part of the Lease Modification Project analyzed in the 2017 Supplemental EIR, implementation of a Turbidity Minimization and Monitoring Plan as an APM would be required to address turbidity that would be generated during sea floor levelling and riprap reconfiguration. This APM would similarly apply to these aspects of construction of the new linear diffuser.

Installation of the Diffuser

The diffuser would be installed prior to, or concurrently with, the wedgewire screen intake, as analyzed for the Lease Modification Project in the 2017 Supplemental EIR. The diffuser system would be installed from an anchored derrick barge with a barge-mounted crane, moored above the tower during construction. Offshore work would be confined to the area in the near vicinity of the existing discharge tower. Construction would take 1 to 2 months with work hours limited to between 7 a.m. and 6 p.m. to adhere to City's Municipal Code. Public access to the offshore work area (about 1,500 feet offshore) would be prohibited during installation of the diffuser.

Personnel access would be provided on a daily basis by an approximately 77-foot-long utility boat. Onshore support vehicles at the selected port would be the same as those analyzed for construction of the Lease Modification Project in the 2017 Supplemental EIR and may include pick-up trucks, forklift, crane, and wheel loader. Construction crews and vessels would vary depending on the scope of work occurring each day, but would be the same as that analyzed for the Lease Modification Project in the 2017 Supplemental EIR:

- A day with lower activity levels would likely require approximately 13 crew members: 10 for the utility boat and three for a smaller (approximately 20 feet long) monitoring boat for marine mammal and turbidity monitoring.
- A day with higher activity levels may require as many as 23 crew members: 16 for a derrick barge; four for a tugboat; and three for the monitoring boat.

Installation of the diffuser may occur before, or concurrently with, the wedgewire screen intake installation. In either case, a similar set of vessels and crew will be required as analyzed in the 2017 Supplemental EIR.

The following steps describe the construction approach to install the new linear diffuser:

1. The riprap on the seaward and shoreward sides of the existing concrete discharge tower would be removed and side-cast using a clam shell crane bucket from the derrick barge for reuse.
2. An area approximately 226 feet by 20 feet, including a portion of the existing discharge tower riprap area, would be leveled for placement of the diffuser. The leveling process would entail the removal of marine sediments. The material removed would be side-cast and would be redistributed by natural ocean currents, as described in the 2017 Supplemental EIR.
3. A hole would be cut into the seaward and the shoreward sides of the existing concrete discharge tower (approximately 6 feet in diameter). Concrete pieces from the holes would be placed on the deck of the barge and would be disposed of in an appropriate land-based facility.
4. Concrete saddles would be positioned in the leveled area.
5. The new linear diffuser would be placed on the concrete saddles using the derrick barge.
6. The new linear diffuser would be secured by anchor straps or other similar methods.
7. The annulus between the diffuser headers and the pre-cut holes in the existing concrete discharge tower will be filled using a pourback (underwater formwork and concrete pumped into the forms from the barge) or by using grout bags.
8. The side-cast riprap would be replaced and additional riprap would be imported and then placed around the structure for scour protection.
9. The existing screen on top of the existing discharge tower would be removed and replaced with a concrete cap that would be secured to the existing concrete discharge tower.

3 DISCHARGE MODIFICATIONS ENVIRONMENTAL ANALYSIS

3.1 Air Quality

Previous Environmental Analysis Summary

The 2017 Supplemental EIR found the Lease Modification Project would increase maximum daily construction oxides of nitrogen (NO_x) emissions by approximately 73.85 pounds per day. Although this would not be a significant impact alone, in combination with the maximum daily construction NO_x emissions from the HBDP (evaluated in the 2010 Subsequent EIR), which range from approximately 39 to 182 pounds per day, would exceed the South Coast Air Quality Management District (SCAQMD) maximum daily construction emission threshold for NO_x. As such, this was determined to be a significant and unavoidable impact during construction in both the 2010 Subsequent EIR and 2017 Supplemental EIR (Impact AQ-1 in the 2017 Supplemental EIR). All other criteria pollutants would not exceed the SCAQMD maximum daily construction emission thresholds. Furthermore, the 2017 Supplemental EIR determined that there would be a significant and unavoidable construction impact from localized particulate matter emissions (PM_{10} and $PM_{2.5}$) because these emissions would exceed the SCAQMD localized significance thresholds. Other criteria pollutant emissions from reactive organic gases (ROG), carbon monoxide (CO), and sulfur oxides (SO_2) would not exceed either the mass emission thresholds or localized significance thresholds during construction and would result in less than significant impacts. Additionally, the 2017 Supplemental EIR concluded that there would be less than significant impacts from all criteria air pollutant emissions during operations. Cumulative impacts were found to be significant and unavoidable in the 2017 Supplemental EIR because the maximum daily NO_x emissions for the combined HBDP and Lease Modification Project construction would exceed the SCAQMD threshold (Impact CMLTV-AQ-1 in the 2017 Supplemental EIR).

Diffuser Modifications Analysis

Construction

Construction of the new linear diffuser would result in a temporary addition of pollutants to the local airshed caused by dust emissions and combustion pollutants from offshore marine vessels, onshore equipment for material transfer at the Port of Long Beach, construction worker vehicles, and off-site haul trucks. NO_x and CO (carbon monoxide) emissions would primarily result from the use of offshore marine vessels, onshore equipment for material transfer, and construction-related motor vehicles that bring and take away construction workers from the construction site. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and, for dust, the prevailing weather conditions.

Construction of the new linear diffuser would involve similar construction equipment, marine vessels, frequency of use, and overall schedule as analyzed for the Lease Modification Project diffuser analyzed in the 2017 Supplemental EIR. Construction of the new linear diffuser would involve similar transportation of diffuser parts to the Port of Long Beach, loading the diffuser onto a barge using onshore forklifts and cranes, transportation of the diffuser via tugboat and barge to the construction area, demolition of the existing discharge tower, and installation of the new linear diffuser as analyzed for the Lease Modification Project in the 2017 Supplemental EIR. Additionally, construction of the new linear diffuser would involve side-casting ocean floor sediment during construction. As stated in the 2017 Supplemental EIR, any excavated suspended sediments would be redistributed by ocean currents.

Riprap moved during construction would be replaced and approximately 600 cubic yards of additional riprap would be imported, which would increase the number of haul truck or marine vessel trips required for delivering of this material. As a result, the construction emissions from worker trips, haul truck trips, construction equipment use, and marine vessel transportation are anticipated to be the same as analyzed for the Lease Modification Project diffuser in the 2017 Supplemental EIR, except for the addition of one round trip from the Port of Long Beach by a tugboat and barge as well as additional round trips by haul trucks to deliver the new riprap to the Port of Long Beach. Based on default values for haul material density and haul truck capacity in the California Emissions Estimator Model (CalEEMod) Version 2016.3.2, transporting the riprap to the Port of Long Beach would result in approximately 26 round trips by these haul trucks (see Appendix A for calculation details). It is assumed these haul truck round trips and the tugboat round trips required to import the additional riprap to the diffuser site would occur near the end of diffuser installation and before the concrete cap is placed on the existing discharge tower. As a result, new linear diffuser construction emissions would increase on one day during diffuser installation.

To determine the possible increase in emissions that could occur from those analyzed in the 2017 Supplemental EIR due to potentially one additional tugboat round trip and additional haul truck trips during construction of the new linear diffuser, information from the same marine vessel emission calculation methodology was used (*Emission Estimation Methodology for Commercial Harbor Craft Operating in California* [CARB 2004}]. Similarly, the same assumptions for tugboat engine characteristics, fuel sulfur content (0.0015% or 15 parts per million [ppm] sulfur diesel fuel to comply with the Harbor Craft Fuel Regulation [CARB 2008]), speed (following the Santa Barbara Channel Vessel Speed Reduction Trial [SBCAPD 2014]), and travel distance used in the 2017 Supplemental EIR were used in this analysis. The maximum daily emissions for construction of the Lease Modification Project were identified to occur on the last day of dredging in the 2017 Supplemental EIR. The new emissions from the tugboat and haul truck trips would occur during one day near the end, but before the last day of diffuser installation. The construction emissions for this day are shown in Table 1, Estimated Daily Maximum Construction Emissions – New Linear Diffuser, and compared to the previously determined maximum daily construction emissions in the 2017 Supplemental EIR. This estimate also assumes simultaneous construction of the wedgewire screen intake and new linear diffuser as a worst case scenario; the same as was assumed in the 2017 Supplemental EIR.

Table 1
Estimated Daily Maximum Construction Emissions – New Linear Diffuser (pounds/day unmitigated)

	VOC	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Additional Emissions During One Day of the New Diffuser Installation [1]	1.95	20.35	10.22	0.04	1.09	0.54
Typical Daily Construction Emissions from 2017 Supplemental EIR [2]	3.22	19.70	15.14	0.02	1.26	0.80
One Day Total Construction Emissions for New Linear Diffuser	**5.17**	**40.05**	**25.36**	**0.06**	**2.35**	**1.34**
2017 Supplemental EIR – Lease Modification Project (For Comparison Only) [1,2]	*6.71*	*73.85*	*34.52*	*0.15*	*4.26*	*2.13*
Threshold	*75*	*100*	*550*	*150*	*150*	*55*
Threshold or 2017 Supplemental EIR Emissions exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Appendix A.
Notes: [1] Assumes one additional tugboat and barge roundtrip from the Port of Long Beach and 38 haul truck roundtrips. A typical barge has a capacity of 1,750 tons (U.S. ACOE 2018). Assuming that riprip has a density of approximately 2 tons to 2.36 tons per cubic yard, the additional riprap import required for the diffuser modifications would be approximately 1,200 tons to 1,416 tons, respectively. Therefore, the additional riprap required for the diffuser modifications would be accommodated by one round trip from the Port of Long Beach by a tugboat and barge.
[2] Shows emissions analyzed for a normal work day during diffuser and wedgewire screen intake installation in the 2017 Supplemental EIR.
[3] Maximum daily construction emissions occurred on the last day of the dredging phase of construction of the Lease Modification Project in the 2017 Supplemental EIR.
[4] Includes emissions from simultaneous construction of the wedgewire screen intake from the Lease Modification Project analyzed in the 2017 Supplemental EIR.

As indicated in Table 1, the additional tugboat and haul truck trips associated with construction of the new linear diffuser, including simultaneous construction of the wedgewire screen intake, would not exceed those of the Lease Modification Project analyzed in the 2017 Supplemental EIR and would not exceed any of the SCAQMD construction thresholds. As such, impacts would be less than significant.

As stated in the 2017 Supplemental EIR, the previous analysis in the 2010 Subsequent EIR identified a significant and unavoidable impact from NO_x emissions that would exceed the SCAQMD daily emission construction threshold (182.15 pounds per day of NO_x during Year 1 of HBDP construction). As a result, a significant and unavoidable cumulative impact from construction NO_x emissions was identified in the 2017 Supplemental EIR (Impact CMLTV-AQ-1 in the 2017 Supplemental EIR). However, the new linear diffuser would not substantially increase the previously identified significant and unavoidable impact in the 2017 Supplemental EIR because the maximum daily construction NO_x emissions from construction of the new linear diffuser would be the same as those analyzed for the Lease Modification Project (occurring during the last day of dredging).

The SCAQMD recommends the evaluation of localized nitrogen dioxide (NO_2), CO, PM_{10}, and $PM_{2.5}$ impacts to sensitive receptors in the immediate vicinity of the project site as a result of construction activities. Construction of the new linear diffuser would occur approximately 1,500 feet offshore. The nearest sensitive receptors to the theoretical onshore area to the new linear diffuser construction emissions would be located approximately 2,600 feet (approximately 792 meters) to the northeast of the diffuser construction area. The project site is located in Source Receptor Area 18, representing North Orange County. Extrapolating the SCAQMD Mass Rate Localized Significance Thresholds Look-up Table at 2,600 feet (approximately 792 meters) in this Source Receptor Area, the localized significance threshold for NO_x would be approximately 297 pounds per day, conservatively assuming a one-acre construction site (SCAQMD 2009)[1]. As a result, even in this conservative scenario the construction of the new linear diffuser would not result in localized criteria pollutant impacts because the maximum daily construction emission of the new linear diffuser would be equal to the 73.85 pounds per day of NO_x estimated for the Lease Modification Project in the 2017 Supplemental EIR (occurring during the last day of dredging and assuming the worst-case scenario of simultaneous construction with the wedgewire screen intake). Therefore, construction of the new linear diffuser would not result in localize criteria pollutant emissions and impacts would be less than significant.

Potential sources that may emit odors during construction activities include diesel equipment and gasoline fumes. However, odors from these sources would be localized and concentrated at the diffuser construction area, approximately 1,500 feet offshore. As such, odors would dissipate before reaching the nearest sensitive receptors and would result in a less than significant impact. Additionally, construction of the new linear diffuser would include the same or similar construction equipment, location, and schedule as the Lease Modification Project for which odor impacts during construction were determined to be less than significant in the 2017 Supplemental EIR.

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[1] Assuming a 1-acre site for the calculation of localized criteria pollutant emissions is considered the most conservative value given by the SCAQMD because it only allows for dispersion of the construction emissions over a 1-acre site before calculating potential localized impacts, instead of a larger site (e.g., 5 acres) that would result in lower localized criteria pollutant impacts (http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds).

Construction of the new linear diffuser would not create a new significant impact on air quality or odors and would not cause a substantially more severe impact on air quality or odors than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

The new linear diffuser could require dive trips for maintenance that would emit criteria air pollutants from marine vessel use for transporting divers between the diffuser and port. However, the new linear diffuser would require the same type and frequency of maintenance as the Lease Modification Project diffuser, which was determined in the 2017 Supplemental EIR to have a less than significant impact.

The new linear diffuser would not substantially change the energy use, vehicle trips, or other sources of criteria air pollutants required for operation of the HBDP. Additionally, the new linear diffuser would not change existing land uses or directly increase population in the area, nor would they result in a considerable cumulative increase in emissions of nonattainment pollutants. Finally, the new linear diffuser would not consist of any uses typically associated with odors. As such, operation of the new linear diffuser would not substantially change the air quality effects of the HBDP that were previously analyzed in the 2017 Supplemental EIR, and impacts would be less than significant.

Operation of the new linear diffuser would not create a new significant impact on air quality or odors and would not cause a substantially more severe impact on air quality or odors than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.2 Marine Biological Resources

Previous Environmental Analysis Summary

Construction and Maintenance

The 2017 Supplemental EIR found that the Lease Modification Project could result in temporary disturbance of special-status species from construction and maintenance activities, including increases in the benthic footprint from side-casting and replacement of the existing riprap around the intake and discharge pipeline towers. However, excluding underwater noise, these impacts were determined to be less than significant. The marine vessels used for construction and maintenance activities were also found to have a less than significant impact from the spread of invasive and non-native marine species with incorporation of mitigation requiring the boats to either be continuously based out of the Port of Long Beach or be cleaned prior to entering southern California.

Operation

The potential entrainment of special-status species from shear forces and salinity levels resulting from the operation of the diffuser under the Lease Modification Project was also evaluated in the 2017 Supplemental EIR. The shear forces created by the brine effluent discharged from the diffuser ports and the elevated salinity levels within the BMZ could affect marine organisms within the BMZ. The 2017 Supplemental EIR assumed that 100% of the fish larvae in the BMZ would experience mortality, while the Desalination Amendment states that 23% of the fish larvae within the entrained flow should be considered to experience mortality. Based on this assumption, the 2017 Supplemental EIR estimated that the Lease Modification Project diffuser would have an entrained flow of 782 MGD, entraining approximately 543 million fish larvae per year under stand-alone operation of the diffuser. However, mitigation measures would be implemented requiring wetland restoration to completely mitigate these potential entrainment impacts. Therefore, the 2017 Supplemental EIR found that impacts from entrainment due to operation of the Lease Modification Project's brine diffuser would be less than significant.

Diffuser Modifications Analysis

Construction and Maintenance

During construction, portions of the ocean floor would be temporarily disturbed for levelling. These sediments would be side-cast during construction, further expanding the area of temporary benthic disturbance. Additionally, the existing riprap around the seaward and shoreward sides of the discharge tower would be temporarily side-cast to the adjacent ocean floor area and re-used at the end of construction. Furthermore, anchoring of the tugboat and barge near the diffuser site during construction would temporarily disturb benthic habitat at the anchoring location. These activities would temporarily (during the approximately 2-month duration of construction) disturb the benthic environment and any sensitive species, such as invertebrates, fish, or marine mammals in and around the riprap at the discharge tower site. Maintenance of the new linear diffuser could also require periodic removal of biofouling by divers that could also affect these sensitive species.

Anchor placement, levelling of the ocean floor, and riprap reconfiguration could impact benthic organisms or result in short-term, temporary displacement. However, benthic organisms are anticipated to recolonize the disturbed benthic environment after completion of construction. Fish would likely avoid the area during construction, avoiding injury or mortality, and return after activities are completed. As such, their displacement would be temporary. Additionally, construction of the new linear diffuser would not increase the area of temporary benthic disturbance due to the anchoring of marine vessels during construction. As stated in the 2017 Supplemental EIR, any excavated suspended sediments would likely be redistributed by ocean currents. As a result, the temporary benthic impacts from construction of the new linear diffuser would not be substantially different than those analyzed for the Lease Modification Project in the 2017 Supplemental EIR.

Various marine mammals and sea turtles could be located in the vicinity of the new linear diffuser construction area but would likely avoid the diffuser area during construction activities by swimming away. There would also be a low potential risk of injury to or mortality of any special-status marine mammal species from accidental collision with construction vessels due to the limited construction timeframe. If a collision occurred, it would not affect the survivability of any special-status marine mammal species populations.

Potential impacts on special-status species during construction would be reduced by implementation of APM-4, providing worker education on protection of marine organisms; APM-5, inclusion of marine species monitoring during construction; and APM-6, an anchoring plan to avoid sensitive habitats, as described in the 2017 Supplemental EIR. These APMs would similarly apply to construction of the new linear diffuser and would reduce potential impacts to special-status species to less than significant.

During construction and maintenance of the new linear diffuser, marine vessels would be used that could be sourced from the Port of Long Beach or closer. These marine vessels have the potential to transport invasive or non-native species into the area. However, the likelihood of transporting invasive species is low because of the short duration of construction and time spent by the marine vessels in different harbors and the existing regulations of ballast water discharge in harbors. Additionally, mitigation measure MM OWQ/MB-4 would further prevent possible introduction of invasive or non-native marine organisms by controlling the selection, docking, and cleaning of marine vessels used during construction and maintenance of the new linear diffuser. The new linear diffuser would have the same potential for the introduction of invasive or non-native marine organisms as the Lease Modification Project analyzed in the 2017 Supplemental EIR and impacts would be less than significant.

Construction of the new linear diffuser would not create a new significant impact to marine biology and would not cause a substantially more severe impact to marine biological resources than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operational

<u>Diffuser Entrainment</u>

The multiport diffuser discharges the brine effluent through nozzles that increase the mixing rate in the receiving waters. Diffuser-related entrainment occurs when marine organisms in the receiving ocean water experience high levels of shear stress for short durations, which is thought to cause mortality. During operation of a diffuser dilution occurs as ambient water is pulled into the jets. This entrained flow mixes with the brine and reduces the salt concentration. Flow shear (change in velocity per distance) due to small (e.g., 1 mm) eddies can damage organisms entrained into the jets. The only region of the jets where this is of concern is the region up to the jet's maximum (terminal) height of rise. The falling portion of the jets is not momentum driven and would not affect marine organisms due to shear.

Based on the new linear diffuser design and using the UM3 module within Plumes18b, developed by the U.S. Environmental Protection Agency (EPA) and in accordance with guidance provided by Roberts (2018a and 2018b), the new linear diffuser would result in an entrained flow of approximately 168 MGD and a BMZ radius of approximately 63.2 feet during standalone operation (Alden, 2018). (It should be noted that the 14-port linear diffuser analyzed in this report has a minor location change from the 14-port linear diffuser analyzed in Alden 2018. However, the ports diameter, velocity, depth, and angle remain the same, thereby not changing the entrained flow and BMZ modeling results found in Alden 2018.) As such, the new linear diffuser would result in a reduction of marine organism entrainment from diffuser shear stressed compared to the entrained flow of 782 MGD evaluated for the Lease Modification Project diffuser during standalone operation in the 2017 Supplemental EIR, which assumed that 100% of the entrained water is subjected to lethal shear force for marine organisms.

As described in the 2017 Supplemental EIR, the new linear diffuser would incorporate mitigation measure MM OWQ/MB-7 requiring implementation of a Diffuser-Operation Marine Life Mitigation Plan. This plan would require compensatory mitigation for marine life impacts, including those from diffuser entrainment, in an amount determined with the Santa Ana RWQCB. As such, impacts from the new linear diffuser would be less than those analyzed in the 2017 Supplemental EIR and impacts would be less than significant.

<u>Diffuser Benthic Impacts</u>

Installation of the new linear diffuser would result in an increase in permanent benthic impacts compared to the existing discharge tower, but these impacts would be less than those analyzed for the Lease Modification Project diffuser in the 2017 Supplemental EIR. The new linear diffuser, and surrounding riprap would encompass a linear area of approximately 226 feet by 20 feet, including a portion of the existing discharge tower riprap area. In aggregate, the new linear diffuser design would encompass a benthic footprint of approximately 6,375 square feet. As such, the benthic footprint will be decreased by approximately 759 square feet compared to the permanent benthic footprint of the Lease Modification Project diffuser analyzed in the 2017 Supplemental EIR. See Figure 2 - Huntington Beach Desalination Project Discharge Structure Layout Schematic.

As described in the 2017 Supplemental EIR, the new linear diffuser would implement mitigation measure MM OWQ/MB-7 requiring implementation of a Diffuser-Operation Marine Life Mitigation Plan. This plan would require compensatory mitigation for marine life impacts in an amount determined with the Santa Ana RWQCB. As such, impacts from the new linear diffuser would be less than those analyzed in the 2017 Supplemental EIR and impacts would be less than significant.

Operation of the new linear diffuser would not create a new significant impact to marine biology and would not cause a substantially more severe impact to marine biological resources than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.3 Greenhouse Gas Emissions

Previous Environmental Analysis Summary

The 2010 Subsequent EIR analyzed the direct and indirect greenhouse gas (GHG) emissions from construction and operation of the HBDP and found that no significant impacts associated with GHG emissions would occur due to the HBDP's energy efficiency and GHG offset purchases. The 2017 Supplemental EIR found that construction of the Lease Modification Project would only increase GHG emissions by 71.64 metric ton of carbon dioxide equivalent (MT CO_2E) or 1.43 MT CO_2E per year over the life of the Lease Modification Project. Operation of the Lease Modification Project would result in a maximum of 14.12 MT CO_2E per year. Additionally, the GHG Plan would offset all GHG emissions resulting in a net zero increase in GHG emissions. Therefore, the 2017 Supplemental EIR determined that the Lease Modification Project's GHG emissions would be below SCAQMD's 10,000 MT CO_2E per year threshold, and its impacts would be less than significant. Additionally, the Lease Modification Project was found to not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases, so that impacts would be less than significant.

Diffuser Modifications Analysis

Construction

Construction of the proposed new linear discharge modifications would result in GHG emissions that are primarily associated with the use of off-road construction equipment and on-road construction vehicles (e.g., haul trucks and vendor/delivery trucks) and worker vehicles.

As stated in Section 3.1, Air Quality, construction of the new linear diffuser would involve similar construction equipment, marine vessels, frequency of use, and overall schedule as analyzed for the Lease Modification Project diffuser analyzed in the 2017 Supplemental EIR, except for the addition of one round trip from the Port of Long Beach by a tugboat and barge as well as additional round trips by haul trucks to deliver the new riprap to the Port of Long Beach. Construction of the new linear diffuser would involve similar transportation of diffuser parts to the Port of Long Beach, loading the diffuser onto a barge using onshore forklifts and cranes, transportation of the diffuser via tugboat and barge to the construction area, demolition of the existing discharge tower, and installation of the new linear diffuser as analyzed for the Lease Modification Project in the 2017 Supplemental EIR. Additionally, installation of the new linear diffuser would involve side-casting ocean floor sediment during construction. As stated in the 2017 Supplemental EIR, any excavated suspended sediments would be redistributed by ocean currents.

Riprap moved during construction would be reused and an additional 600 cubic yards of riprap would be imported, which would increase the number of haul truck and tugboat trips required for delivering this material. As a result, the construction emissions resulting from haul truck trips and marine vessel transportation are anticipated to increase compared to those analyzed for the Lease Modification Project diffuser in the 2017 Supplemental EIR.

To determine the possible additional in emissions that could occur from those analyzed in the 2017 Supplemental EIR due to one construction day with an additional tugboat round trip and 26 haul truck round trips during construction of the new linear diffuser, information from the same marine vessel emission calculation methodology was used (*Emission Estimation Methodology for Commercial Harbor Craft Operating in California* [CARB 2004}]. Similarly, the same assumptions for tugboat engine characteristics, speed (following the Santa Barbara Channel Vessel Speed Reduction Trial [SBCAPD 2014]), and travel distance used in the 2017 Supplemental EIR were used. The potential increase in GHG emissions from construction of the new linear diffuser are shown in Table 2, Estimated Annual Construction GHG Emissions – New Linear Diffuser. This estimate assumes simultaneous construction of the wedgewire screen intake and new linear diffuser as a worst case scenario; the same as was assumed in the 2017 Supplemental EIR.

Table 2
Estimated Annual Construction GHG Emissions – New Linear Diffuser

Modifications	MT CO_2E	Amortized Annual Emissions[1]
2017 Supplemental EIR – Lease Modification Project [2]	71.64	1.43
New Linear Diffuser Emissions [3]	4.21	0.08
Total	**75.85**	**1.52**

Source: Appendix A.
Notes: MT = metric tons; CO_2E = carbon dioxide equivalent
[1] Emissions amortized over the 50 year project life time.
[2] Includes emissions from simultaneous construction of the wedgewire screen intake from the Lease Modification Project analyzed in the 2017 Supplemental EIR.
[3] Assumes one tugboat round trip and 26 haul truck round trips during one construction day for installation of the new linear diffuser.

Construction-related GHG emissions would not represent a long-term source of GHG emissions. Additionally, as stated in the 2017 Supplemental EIR the GHG Plan requires the offset of 100% of the construction-related GHG emissions. Therefore, the new linear diffuser's GHG emissions would remain below SCAQMD's 10,000 MT CO_2E per year threshold, would be offset to net zero GHG emissions, and would not conflict with any applicable GHG regulations. Therefore, impacts would be less than significant.

Construction of the new linear diffuser would not create a new significant impact from GHG emissions and would not cause a substantially more severe impact from GHG emissions than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

The new linear diffuser could require dive trips for maintenance that would emit GHG's from marine vessel use for transporting divers between the diffuser and port. However, the new linear diffuser would require the same type and frequency of maintenance as the Lease Modification Project diffuser, which was determined in the 2017 Supplemental EIR to have a less than significant impact.

The new linear diffuser would not substantially change the energy use, vehicle trips, or other sources of criteria air pollutants required for operation of the HBDP. Additionally, the new linear diffuser would not change existing land uses or directly increase population in the area that could indirectly increase cumulative GHG emissions. As such, operation of the new linear diffuser would not substantially change the operational GHG effects of the HBDP that were previously analyzed in the 2017 Supplemental EIR, would not conflict with any applicable GHG regulations, and would have less than significant impacts.

Operation of the new linear diffuser would not create a new significant impact from GHG emissions and would not cause a substantially more severe impact from GHG emissions than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.4 Hydrology and Water Quality

Previous Environmental Analysis Summary

The 2010 Subsequent EIR analyzed potential onshore and offshore water quality effects from onshore construction and operation of the HBDP and determined that impacts would be less than significant with implementation of a Storm Water Pollution Prevention Plan (SWPPP), Water Quality Management Plan (WQMP), and applicable best management practices (BMPs) and control measures in a National Pollution Discharge Elimination System (NPDES) permit for the BHDP.

The 2017 Supplemental EIR analyzed the potential short-term effects to ocean water quality, including turbidity and chemical spills, which could occur from riprap side-casting, removal of the existing discharge tower, and installation of the new linear diffuser. With implementation of APMs requiring turbidity minimization, spill response planning, and worker training, impacts to ocean water quality during construction of the Lease Modification Project were determined to be less than significant.

During maintenance of the Lease Modification Project, the 2017 Supplemental EIR identified potential effects from turbidity and chemical spills from boats and divers during maintenance activities. However, with the implementation of APMs to minimize turbidity, to plan for spill responses, and to train maintenance workers on potential water quality effects, impacts were determined to be less than significant from the Lease Modification Project.

The 2017 Supplemental EIR also found that ocean water quality could be affected during operation of the Lease Modification Project if chemicals could leach into the water column from the wedgewire screens used for the intake. The Lease Modification Project would construct the rotating wedgewire screens from stainless steel, unless it can be proved to the Commission, Water Boards, and Coastal Commission staffs with future information that installing stationary copper-nickel alloy wedgewire screens would not result in significant adverse environmental impacts. As a result, the 2017 Supplemental EIR determined that there would be less than significant impacts because rotating stainless steel wedgewire screens would not leach chemicals into the water column.

The brine effluent from the Lease Modification Project would affect ocean water quality if it resulted in salinity levels in excess of standards. During stand-alone operation an annual average flow rate of approximately 56.7 MGD of 63.1 ppt brine effluent would be diluted to within 2 ppt of natural salinity within 80 feet of the diffuser port for the Lease Modification Project. This is less than the maximum distance of 328 feet required by the Desalination Amendment and was determined to result in a less than significant impact in the 2017 Supplemental EIR (see Section 3.2, Marine Biological Resources, for details of the BMZ analysis).

Diffuser Modifications Analysis

Construction and Maintenance

Construction activities, including anchoring marine vessels and levelling of the ocean floor sediment for installation of the new linear diffuser, and reconfiguration of riprap could disturb ocean floor sediments and increase turbidity. Additionally, construction and maintenance of the new linear diffuser could include potential water quality impacts resulting from fuel, oil, or construction vessel bilge releases.

However, construction of the new linear diffuser would require implementation of APM-1, Best Management Practices for protecting ocean water quality; APM-2, Turbidity Minimization and Monitoring Plan; and APM-3, Spill Prevention and Response Plan as described in the 2017

Supplemental EIR. These requirements would help reduce sediment generation during offshore construction and maintenance of the proposed modifications and reduce the potential risk of spilling of hazardous chemicals. The Turbidity Minimization and Monitoring Plan also includes identification of equipment and sediment disposal locations as well as maintenance monitoring to ensure that the Desalination Amendment turbidity requirements are achieved. As a result, construction and maintenance of the new linear diffuser would have the same potential impacts to ocean water quality as the Lease Modification Project described in the 2017 Supplemental EIR and impacts would be less than significant.

Construction of the new linear diffuser would not create a new significant impact to hydrology and water quality and would not cause a substantially more severe impact to hydrology and water quality than that of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

The diffuser design has been changed to comply with the requirements of the Desalination Amendment based on guidance by Roberts (2018a and 2018b). The new linear diffuser is designed to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize mortality of all forms of marine life during operation. (It should be noted that the 14-port linear diffuser analyzed in this report has a minor location change, from the 14-port linear diffuser analyzed in Alden 2018. However, the ports diameter, velocity, depth, and angle remain the same, thereby not changing the entrained flow and BMZ modeling results found in Alden 2018.) The new linear diffuser design includes 14 discharge ports submerged 17.8 feet MLLW below the ocean surface. The ports would be installed at an angle of 60° with an effective diameter of 1.28 feet for each port. The diffuser is designed for a peak daily flow of 62.5 MGD and a corresponding discharge salinity of 62.4 ppt. The resulting jet velocity of the discharge at this peak daily flow would be approximately 5.32 feet per second, which would dilute the brine discharge to within 2 ppt of the ambient salinity value of 33.5 ppt within a 63.2 foot radius of the diffuser. The resulting BMZ area would encompass approximately 0.64 acres (Alden, 2018). As such, the new linear diffuser design would comply with the Desalination Amendment, which requires that brine discharge salinity declines to within 2 ppt over natural background salinity within 328 feet (100 meters) from the point of discharge (natural background salinity at Huntington Beach has been measured at approximately 33.5 ppt). It is also less than the BMZ radius of 79.7 feet (24.3 meters) calculated for the Lease Modification Project diffuser in the 2017 Supplemental EIR that was determined to have a less than significant impact.

Operation of the new linear diffuser would not create a new significant impact to hydrology and water quality and would not cause a substantially more severe impact to hydrology and water quality than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.5 Noise

Previous Environmental Analysis Summary

The 2010 Subsequent EIR found that during construction from equipment and truck use and during operation of the pumps and equipment associated with the HBDP, noise and vibration impacts to surrounding sensitive receptors would be less than significant by adherence to the construction noise restrictions in Chapter 8.40, Noise Control, of the Municipal Code and by enclosing the outdoor pump stations. Similarly, the 2017 Supplemental EIR found that noise impacts from construction and operation of the Lease Modification Project would occur offshore, would not exceed applicable community noise standards, and would be less than significant.

The 2017 Supplemental EIR also evaluated the potential effects of underwater noise and vibration from construction of the Lease Modification Project on seabirds, fish, and marine mammals. Specifically, the 2017 Supplemental EIR determined that if detailed geotechnical studies find that vibratory pile driving is a feasible construction method for use during installation of the wedgewire screen intake only (installation of the diffuser would not require pile driving), then underwater noise impacts on sensitive marine species, including migrating whales, would be less than significant with incorporation of mitigation specifying pile driving work windows and requiring a soft start for pile driving. If vibratory pile driving is not found to be feasible after detailed geotechnical evaluation, then impact pile driving would need to be used during installation of the wedgewire screen intake. The 2017 Supplemental EIR determined that impact pile driving during installation of the wedgewire screen intake would result in significant and unavoidable underwater noise impacts on sensitive marine mammals with implementation of all feasible mitigation (Impact OWQ/MB-3 in the 2017 Supplemental EIR). However, pile driving is not required for installation of the diffuser and would not result in a significant impact due to underwater noise.

Diffuser Modifications Analysis

Construction

Onshore Sensitive Receptors

Construction of the new linear diffuser would generate noise due to the use of heavy construction equipment including marine vessels, similar to the Lease Modification Project analyzed in the 2017 Supplemental EIR. Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive receptors.

The City provides an exemption for noise associated with construction and grading in Municipal Code Section 8.40.090, Special Provisions, provided that activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday. In general, all outdoor living areas are intended to be compatible with noise levels with a community noise equivalent level (CNEL) less than 65 dBA. Similarly, indoor living spaces are intended to be compatible with interior noise levels less than CNEL 45 dBA.

During construction of the new linear diffuser, onshore sensitive receptors, including residential land uses, could be exposed to short-term, intermittent noise increases. The new linear diffuser would have similar construction equipment, construction schedule, and distance to sensitive receptors as the Lease Modification Project. The 2017 Supplemental EIR identified the residences to the west of the construction site as the most sensitive receptors to short-term construction noise. At this location construction noise levels are predicted to range up to 57 dBA equivalent sound level (L_{eq}) for the diffuser. If construction of the diffuser and wedgewire screen intake overlap, the resulting maximum noise level during this 2-month period would be 60 dBA L_{eq} at these closest onshore sensitive receptors.

These noise levels would be below the significance threshold of 65 dB and would occur during the allowable hours of construction. Construction noise impacts are also short-term and would cease upon completion of construction. The combined construction noise levels would be barely perceptible compared to the projects being constructed separately, as the largest increase in noise over ambient noise levels is 3 db. In addition, the 2017 Supplemental EIR requires implementation of mitigation measures MM CON-15 for the use of mufflers on construction equipment, compliance with the City of Huntington Beach Municipal Code-Noise Control Chapter, notifying property owners of construction, use of noise attenuation methods where feasible, avoiding noise sensitive areas with haul trucks, and placing stationary equipment so that noise is emitted away from sensitive noise receptors would further minimize any impacts from construction noise.

Construction of the new linear diffuser system would take approximately 2 months and would primarily occur approximately 1,500 feet offshore. Due to the distance from onshore receptors, noise generated from construction equipment would be below acceptable exterior noise level standards established by the City and impacts would be less than significant.

Offshore Sensitive Receptors

Construction at the diffuser location and operation of marine vessels during construction would generate underwater noise that could result in short-term elevated noise levels. The elevated noise levels near the diffuser could cause behavioral avoidance or injury to marine mammals, sea turtles, sea diving birds, and fishes.

The new linear diffuser would use similar construction equipment, schedule, and location as the Lease Modification Project. The 2017 Supplemental EIR found that a significant impact would only occur if impact pile driving was used during construction of the wedgewire screen intake. However, the diffuser would not require the use of pile driving and would have lower temporary noise levels during construction. Noise from tugboat and crew boat engines would be similar to that from other vessels that routinely transit the ocean surface, and noise from ship traffic would be comparable to other routine noise-generating activities in the area. Therefore, diffuser construction noise would not substantially affect offshore sensitive receptors as demonstrated in the analysis for construction of the Lease Modification Project in the 2017 Supplemental EIR. Impacts to offshore sensitive receptors from construction of the new linear diffuser would be less than significant.

Construction of the new linear diffuser would not create a new significant impact from noise and would not cause a substantially more severe impact from noise on either onshore or offshore sensitive receptors than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

Onshore Sensitive Receptors

Onshore sensitive receptors could be exposed to noise from operation of the HBDP, including pumps and worker vehicle trips. The new linear diffuser would not substantially modify these onshore operations and analysis in the 2010 Subsequent EIR and 2017 Supplemental EIR found that noise impacts to onshore sensitive receptors would be less than significant. Additionally, the Lease Modification Project would be required to implement MM NOI-1, requiring any outdoor pumps to achieve acceptable noise levels in the City's Municipal Code. This mitigation measure would also apply to reducing operational noise from the new linear diffuser. Therefore, operational noise impact to onshore sensitive receptors would be less than significant.

Offshore Sensitive Receptors

Operation of the new linear diffuser would not substantially change the noise effects of the Lease Modification Project analyzed in the 2017 Supplemental EIR. Maintenance could involve dive trips by a crew boat for intermittent inspection of the diffuser. However, these noise levels would be lower than those produced during construction at the same offshore location of the diffuser, which would have a less than significant impact on offshore sensitive receptors. The use of a crew boat for maintenance would produce similar noise levels as existing boating activities in the area and would result in less than significant noise impacts to offshore sensitive receptors.

Operation of the new linear diffuser would not create a new significant impact from noise and would not cause a substantially more severe impact from noise on either onshore or offshore sensitive receptors than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.6 Recreation

Previous Environmental Analysis Summary

The 2010 Subsequent EIR analyzed potential effects of the HBDP construction and operation to onshore recreation, including consistency with policies governing public access and use of recreational facilities, and determined that impacts would be less than significant.

The 2017 Supplemental EIR evaluated the potential effects off marine vessels used during construction and maintenance of the Lease Modification Project on offshore recreational activities. The impact on beach and nearshore recreation, including surfing and swimming, was determine to be less than significant because construction and operation of the Lease Modification Project would occur at a substantial distance offshore and away from these recreational use areas. The 2017 Supplemental EIR found that the use of marine vessels during construction could impede recreational boating, diving, and fishing activities, but impacts would be less than significant because the Lease Modification Project recreation would be precluded from the construction area and public noticing of construction activities would occur. Similarly, during operation the intake and diffuser components of the Lease Modification Project were determined to result in less than significant impacts because they would be submerged sufficiently underwater and maintenance operations would be short-term and temporary.

Diffuser Modifications Analysis

Construction

The proposed diffuser design modifications would occur approximately 1,500 feet offshore at the end of the HBGS discharge pipeline, the same general location as the diffuser analyzed as part of the Lease Modification Project in the 2017 Supplemental EIR. As such, construction would not affect beach and nearshore recreation, similar to the Lease Modification Project analyzed in the 2017 Supplemental EIR, and impacts to beach and nearshore recreation would be less than significant.

The new linear diffuser design would encompass a smaller benthic footprint and would be at a similar submerged depth as the Lease Modification Project. Construction of the new linear diffuser would involve the same type of construction equipment, including marine vessels, and would occur over a similar amount of time as the Lease Modification Project construction.

Anchoring a marine vessel near the diffuser construction area could conflict with recreational boating, diving, and fishing activities in the offshore area. However, the anchoring of the tugboat would occur near the construction site and the anchored barge that was analyzed in the 2017 Supplemental EIR. This addition would only incrementally increase the potential impediment to recreational activities in the area. Furthermore, the recreational access to the construction area would be precluded during construction while recreational access to the vast surrounding ocean areas would remain open.

As specified in the 2017 Supplemental EIR, the Lease Modification Project would already be required to have the U.S. Coast Guard issue a Local Notice to Mariners containing information on the locations, times, and details of construction activities that may pose potential hazards (MM TRM-1 in the 2017 Supplemental EIR). Construction of the new linear diffuser design would adhere to the same time of day (7 a.m. to 6 p.m., 7 days a week) and time of year schedule restrictions (approximately 2 months) as required for the Lease Modification Project in the 2017 Supplemental EIR, further reducing potential conflicts with recreational uses in the vicinity of construction activity. Therefore, the effect of the new linear diffuser on recreation would be minimal and short-term. Any impacts from construction of the new linear diffuser on recreational boat access would be less than significant.

The removal of riprap in the construction area could disturb fish and invertebrates that could be attracted to the riprap. However, this would only result in a temporary benthic impact as sediment would likely be naturally relocated by ocean currents and the riprap replaced before the end of construction. Additionally, construction activities for the new linear diffuser would involve less permanent benthic impact than the amount previously analyzed for the Lease modification Project in the 2017 Supplemental EIR. Fish and invertebrates are also anticipated to return to the riprap after it is replaced and access to the diffuser construction area would remain closed to recreational fishing. Therefore, there would only be a minor, short-term effect on fishing recreation in the immediate vicinity of the diffuser construction area and impacts would be less than significant.

Construction of the new linear diffuser would not create a new significant impact to recreation and would not cause a substantially more severe impact to recreation than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

During operation, the new linear diffuser would be submerged below the ocean surface and no work crews would be permanently stationed at the diffuser location. Maintenance of the new linear diffuser is anticipated to be the same as the Lease Modification Project diffuser, which could involve quarterly dives to inspect and clean (as necessary) the external diffuser surfaces. Each maintenance dive is not anticipated to last more than one day at a time. The short-term, intermittent, and minimal presence of these maintenance dives, in addition to the distance of maintenance activities from shore would result in less than significant impacts to beach, nearshore, and ocean recreation. Therefore, operation of the new linear diffuser would not create a new significant impact to recreation and would not cause a substantially more severe impact to recreation than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

3.7 Marine Transportation

Previous Environmental Analysis Summary

The 2010 Subsequent EIR evaluated the potential for construction and operation of the HBDP to effect onshore transportation from the addition of worker vehicles and trucks to roadways. However, impacts from construction and operation of the HBDP to onshore transportation were determined to be less than significant.

The 2017 Supplemental EIR analyzed the Lease Modification Project's potential effect on offshore transportation. During construction of the Lease Modification Project, marine vessels would be transiting to and from the Port of Long Beach and would be anchored at the construction site. Similarly, during maintenance of the wedgewire screen intake, marine vessels would be used. The 2017 Supplemental EIR found that these activities would have a less than significant impact because they involved only minimal marine vessel trips, would implement public noticing of activities as a mitigation measure, and would preclude non-related marine vessel travel within the construction area.

Diffuser Modifications Analysis

Construction

As described in Section 2, Project Description, and similar to the Lease Modification Project analyzed in the 2017 Supplemental EIR, construction of the proposed new linear diffuser would increase marine vessel traffic between the Port of Long Beach and the diffuser construction site. Construction would include the use of a tugboat to deliver a 180-ton derrick barge to the diffuser construction area, as well as two to three additional marine vessels to transport work crews, supplies, and to monitor during construction.

Marine vessel use during construction of the new linear diffuser would be short-term, lasting approximately 2 months. Construction of the new linear diffuser would also be subject to the U.S. Coast Guard public noticing requirements established for the Lease Modification Project (see MM TRM-1 in the 2017 Supplemental EIR). As such, construction activities are not likely to substantially reduce the existing safety level of marine transportation in and around the Port of Long Beach or the construction area due to the small size of the construction marine vessels, small number of trips per day, and use of established methods for coordinating marine vessel movement in these areas. Therefore, impacts would be less than significant and similar to those analyzed for the Lease Modification Project in the 2017 Supplemental EIR.

Construction of the new linear diffuser would not create a new significant impact to marine transportation and would not cause a substantially more severe impact to marine transportation than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

Operation

After construction is completed, the top of the new linear diffuser would be submerged at the same or lower depth than the existing discharge tower on the HBGS discharge pipeline thereby allowing sufficient deep for typical marine vessels in the area to navigate the site (see Section 4.10 of the 2017 Supplemental EIR). Therefore, installation of the new linear diffuser would result in a less than significant impact due to obstruction of marine vessel traffic.

Maintenance of the diffuser would be similar to that described for the Lease Modification Project in the 2017 Supplemental EIR and could involve quarterly dive trips to ensure proper operation. Each maintenance dive is not anticipated to last more than one day at a time. The short-term, intermittent, and minimal presence of these maintenance dives would result in less than significant impacts to marine transportation. Therefore, operation of the new linear diffuser would not create a new significant impact to marine transportation and would not cause a substantially more severe impact to marine transportation than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

4 CONCLUSION

The new linear diffuser modifications would require additional riprap to be imported that would result in a small increase in construction GHG emissions and criteria air pollutant emissions for one day during diffuser installation. Although construction GHG emissions would slightly increase with the new linear diffuser compared to the Lease Modification Project, they would not be substantially different than those for the Lease Modification Project, would not exceed the SCAQMD threshold, and would be 100% offset through implementation of the GHG Plan; therefore, resulting in a less than significant impact. Additionally, the new linear diffuser would have the same level of impacts from criteria pollutant emissions because it would not exceed the maximum daily construction emissions analyzed for the Lease Modification Project in the 2017 Supplemental EIR (that would occur during dredging).

The new linear diffuser design would decrease the permanent benthic impact of the diffuser, decrease the amount of entrained flow through the diffuser, and result in a smaller BMZ radius that would reduce impacts to marine biological resources as well as hydrology and water quality compared to the Lease Modification Project.

Impacts to recreation, marine transportation, and noise would be similar to those analyzed for the Lease Modification Project in the 2017 Supplemental EIR, which were also determined to be less than significant.

Therefore, construction and operation of the new linear diffuser would not create any new significant impact and would not cause a substantially more severe impact than those of the Lease Modification Project analyzed in the 2017 Supplemental EIR.

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APPENDIX A

Air Quality and Greenhouse Gas Calculations

APPENDIX B

Figures

twb Environmental Research and Consulting

February 5, 2019

Scott Maloni
Poseidon Water
5780 Fleet Street, Suite 140
Carlsbad, CA 92008

Re: Appendix BBBBB-3: Technical Memorandum: Linear Diffuser Design Modification for the Proposed Huntington Beach Desalination Plant

Dear Scott,

I am pleased to submit this memorandum (memo) which clarifies the realignment of the 14-port linear diffuser for the proposed Huntington Beach Desalination Plant, which was described in the November 27, 2018 Dudek report entitled *"Huntington Beach Desalination Plant Response to Request for Information Regarding Environmental Analysis of the 2018 Diffuser Modifications"* (Appendix BBBBB-2). This memo was prepared to respond directly to the Santa Ana Regional Water Quality Board staffs' request for this information during the January 31, 2018 call with Poseidon and in the Regional Board staff's February 4, 2019 letter.

I look forward to receiving your feedback on this memo. Please feel free to call with any questions or comments.

Sincerely,

Timothy W. Hogan

Timothy W. Hogan
TWB Environmental Research and Consulting, Inc.

Linear Diffuser Realignment Description

At the request of the Santa Ana Regional Water Quality Control Board staff, Poseidon developed a linear diffuser design for the proposed Huntington Beach Desalination Plant (HBDP) based on the method described by Dr. Phil Roberts (2018a, b).

The initial 14-port linear diffuser design (Figure 1) was submitted on August 3, 2018 as part of Appendix BBBBB in a report prepared by Alden Research Laboratory (Alden 2018). Appendix BBBBB also included an environmental analysis report from Dudek (Dudek 2018a) which evaluated the initial 14-port linear diffuser design.

The CA State Lands Commission (SLC) staff issued a letter dated September 25, 2018, requesting clarification whether the footprint of the revised linear diffuser was inside the authorized lease area. Based on the Lease Amendment No. PRC 1980.1 accompanying exhibits A and B (See 2010 SLC Lease - Regional Board Application Appendix I), the revised linear diffuser's footprint appeared to be within the authorized lease area; however, it was not possible to indisputably document without an extensive surveying effort. Therefore, in response, Poseidon modified the alignment of the 14-port linear diffuser (relative to the existing intake tower) that lies within the authorized lease area (Figure 2). The modified linear diffuser alignment and a revised environmental analysis from Dudek (Dudek 2018b) were submitted as Appendix BBBBB-2 on November 27, 2018.

The only modification to the linear diffuser was in its alignment relative to the existing discharge tower to which it will be connected. Rather than utilizing a single continuous header for all 14 ports, the diffuser was split into two 7-port header sections with one section placed on either side (shoreward and seaward) of the existing discharge tower.

Table 1 provides a comparison of the design details for each 14-port linear diffuser alignment. The overall length of the diffuser and the length of the riprap associated with it have increased slightly; however, the total seabed area effected has not since the elbow needed to connect to the existing discharge tower is no longer included (see Figure 1 and Figure 2). Therefore, relative to the FSEIR, there are no additional benthic impacts associated with the modified alignment of the 14-port linear diffuser. Similarly, as reported in Appendix NNNNN, the brine mixing zone (BMZ) area is 1.09 acres. This compares favorably to the previous BMZ area of 0.64 acres. In addition, the size of the realigned diffuser's BMZ is consistent with the operational impacts evaluated in the FSEIR and still remains well within the OPA's 100-meter (328 foot) boundary. Therefore, operation of the realigned linear diffuser would not create a new significant impact to marine biology and would not cause a substantially more severe impact to marine biological resources than that of the Lease Modification Project analyzed in the 2017 FSEIR.

The initial and modified 14-port linear diffuser alignments are depicted in Figure 1 and Figure 2, respectively.

Per the Regional Board staff's February 4, 2019 letter requesting additional clarification, an updated shearing analysis using the Roberts (2018a, b) methodology is unnecessary. The realignment of the diffuser with the discharge tower does not affect the number, diameter or angle of the diffuser ports or the volume and velocity of the discharged water. Consequently, the previously submitted shearing analysis is unchanged.

Furthermore, the analysis of the brine mixing zone reflecting the realigned brine diffuser was submitted on January 18, 2019 in Appendix NNNNN.

Conclusion

The initial 14-port linear diffuser for the HBDP was realigned based on a preliminary engineering-level design. The diffuser was realigned with the existing discharge tower, but no changes were made to the diffuser's functional design (e.g., number of ports, port angle, port diameter, discharge velocity). This memo documents the realignment and is consistent with the description previously presented in Appendix BBBBB-2. The modified alignment of the 14-port diffuser continues to represent a diffuser design for the HBDP based on the method described by Dr. Phil Roberts (2018a, b).

Table 1. Comparison of initial and modified 14-port linear diffuser alignments.

Design Component	Initial Alignment	Modified Alignment
Number of ports	14	14
Port diameter (effective opening)	1.28 ft	1.28 ft
Port spacing	20.4 ft between ports on same side of header; 10.4 ft between ports on opposite sides of header	20.4 ft between ports on same side of header; 10.4 ft between ports on opposite sides of header
Port angle of inclination	60°	60°
Port discharge elevation	-17.8 ft	-17.8 ft
Port discharge velocity	5.3 ft/sec at flow of 62.5 MGD	5.3 ft/sec at flow of 62.5 MGD

Header diameter	4 ft	4 ft
Number of headers	1	2
Overall length of diffuser	194 ft - single section	208 ft - two sections of equal length
Overall length with riprap	212 ft	228 ft
Riprap area	6,400 sq ft	6,375 sq ft
BMZ area	0.64 acres	1.09 acres

twb

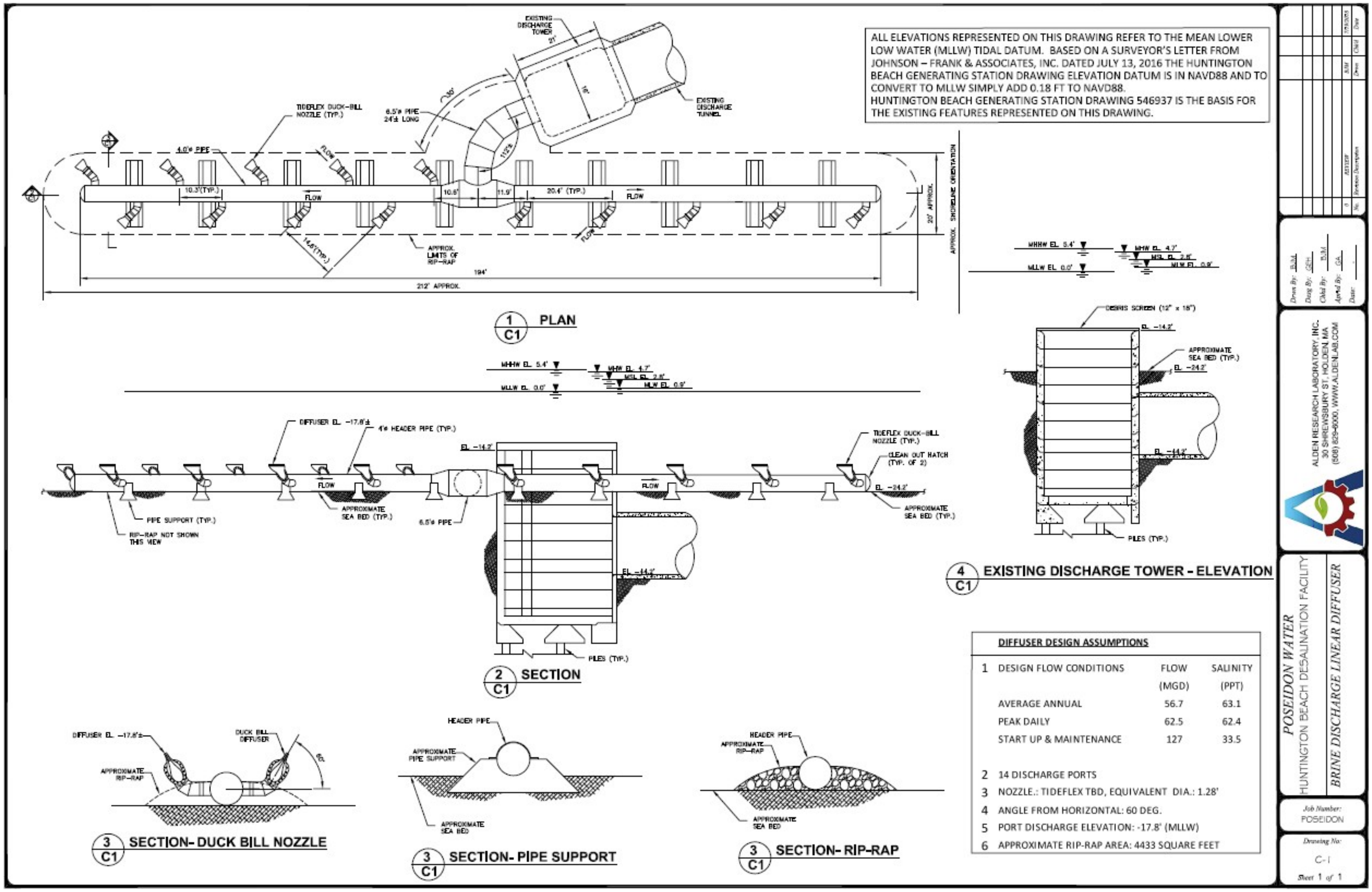

Figure 1. Initial 14-port linear diffuser design. Design is documented in Appendix BBBBB (August 3, 2018).

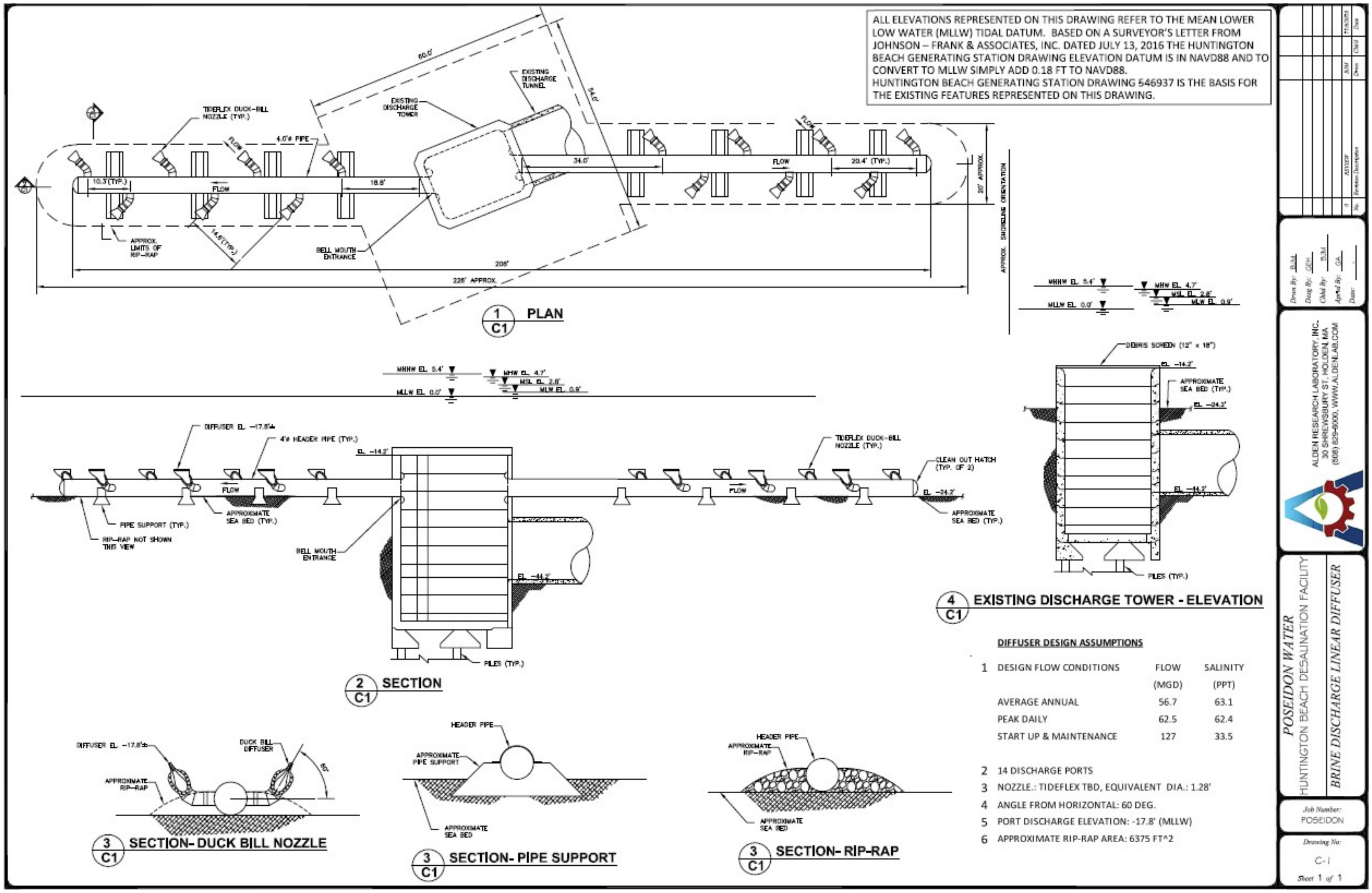

Figure 2. Modified 14-port linear diffuser design. Design is documented in Appendix BBBBB-2 (November 27, 2018).

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Solving flow problems since 1894

Technical Memorandum

To: Ms. Josie McKinley and Mr. Patrick Crain, Poseidon

From: George Hecker, Michael Rounds, Greg Allen and Elizabeth White

Date: July 31, 2018

Re: **Linear Diffuser Optimization and Design for Poseidon's Huntington Beach Desalination Plant**

Alden Research Laboratory, Inc. (Alden) has prepared a design of the brine discharge diffuser at Poseidon Water Surfside's (Poseidon) proposed Huntington Beach Desalination Plant (HBDP). The design was developed following procedures described in a paper by Philip Roberts titled *Brine Diffusers and Shear Mortality* (Roberts, 2018a) and *Brine Diffusers and Shear Mortality: Application to Huntington Beach* (Roberts, 2018b). The main goal of the analysis was to minimize the entrainment flow through the optimization of the diffuser while remaining within the Ocean Plan's brine mixing zone requirements. This Technical Memorandum (TM) provides information on the design assumptions, methods, and results for a linear diffuser with fourteen diffuser "duck-bill" check valves (ports). At the average design flow of 62.5 MGD, the check valves have an open area equivalent to a 1.28 ft round opening. During rare occurrences, such as during HBDP start up, the linear diffuser does have the capability to discharge up to 127 MGD. A drawing of the conceptual linear diffuser design is presented in Appendix A.

This TM is organized into two sections. The first section discusses the validation of the UM3 model using Roberts' input and output relative to his alternate designs discussed in *Brine Diffusers and Shear Mortality: Application to Huntington Beach* (Roberts, 2018b). The second section discusses the design and modeling process Alden used to develop the new fourteen port diffuser using Roberts' methodology.

1.0 UM3 Model Validation

Alden used the UM3 module within Plumes18b, developed by the U.S. Environmental Protection Agency (EPA) to verify the results determined by Roberts in *Brine Diffusers and Shear Mortality: Applications to Huntington Beach* (Roberts, 2018b). UM3 is a quasi-three dimensional model used for simulating single and multi-port submerged discharges. The model uses a Lagrangian function that determines the projected-area-entrainment (PAE) hypothesis to quantify forced entrainment. The model requires input of the diffuser geometry, flow, salinity, density, and temperature. In addition, ambient salinity, density, temperature, and current are required. UM3 uses this information to calculate a plume profile and the dilution of the plume through the water column.

Roberts conducted a review of the proposed diffuser design originally presented by Poseidon in Roberts 2018b. Roberts uses the procedures outlined in Roberts 2018a to present the three alternative configurations of the diffuser design in Roberts 2018b. These configurations include a single multiport "rosette" diffuser with three ports, a linear diffuser with six ports, and a linear diffuser with 10 ports. All three of the alternate configurations were analyzed by Roberts using a port depth of 27 feet. Roberts used 90% of the port depth for submergence in the UM3 model runs which equals 24 feet. Roberts used UM3 to determine the entrained flow up to the jet's maximum (terminal) rise height for each of these alternative designs. The UM3 model input values are provided in Table 1. It should be noted that the existing water depth is 24.2 feet below Mean Lower Low Water (MLLW) and Poseidon's proposed design has a port depth of 17.8 feet. Consistent with Roberts 2018b, Poseidon used 90% of the port depth for submergence in the analysis, which equals 16.0 feet.

Table 1 Roberts 2018b - UM3 validation input data

Scenario	No. of port s	Diameter (in)	Brine Flow (mgd)	Submergence of Jet Flow (ft)	Angle (deg)	Ambient Salinity (ppt)	Brine Salinity (ppt)	Ambient Temp. (°C)	Brine Temp (°C)
Single riser, alternative design	3	26.9	62.5	24	42	33.5	62.4	20	22
Alternative linear diffuser	10	14.5	62.5	24	60	33.5	62.4	20	22
Alternative linear diffuser	6	21.6	62.5	24	60	33.5	62.4	20	22

Alden developed a UM3 model to evaluate each of the three designs presented in Roberts 2018b to validate use of the model and verify that the results were the same as the dilution values presented by Roberts. Table 2 compares the dilution values determined by Roberts to those determined by Alden.

Table 2 shows that the dilution values for the single riser alternative match those presented by Roberts and the linear diffuser dilution values are within a tenth of Roberts 2018b's dilution values. Alden did not have UM3 printouts for the linear diffuser scenarios and therefore was not able to verify the exact input and output values for these runs. However, based on this comparison, Alden determined that the model was running as expected.

Table 2 Comparison of Roberts 2018b alternative design dilution with Alden results

Scenario	No. of ports	Diameter (in)	Angle (deg)	UM3 Average Dilution S_{ta} (per Roberts Report 2018b Tables 3 and 4)*	Alden UM3 (Dilution at Terminal Rise)
Single riser, alternative design	3	26.9	42	4.3	4.3
Alternative linear diffuser	10	14.5	60	5.8	5.7
Alternative linear diffuser	6	21.6	60	3.7	3.6

*Value is for terminal rise position of jet trajectory

2.0 Diffuser Design

2.1 Diffuser Design per Roberts 2018a Empirical Method for 60 degrees

Prior to using the program UM3 to help design a linear diffuser for the HBDP brine discharge, a check on using UM3 was made (see Tables 1 and 2) to insure the same output was obtained by Alden for the same input used by Roberts (Roberts, 2018b). However, this check on using UM3 was delayed because some of the input data on ambient ocean water and brine density and salinity were not available. To proceed with a diffuser design without waiting for the reproduction of UM3 results, a method of using the governing equations for brine jet characteristics presented by Roberts (Roberts, 2018a) to determine key parameters was developed.

This section presents the technical approach for optimizing the diffuser using equations based on empirical evidence as discussed by Roberts in Roberts 2018a. The equations are discussed below in logical but not necessarily sequential order. The required inputs and their values used in the calculations are:

- Brine flow (62.5 MGD)
- Submergence of jet origin at MLLW (17.8 ft)
- Vertical jet angle (60 deg)
- Density of ambient ocean water (1023.6 kg/m^3)
- Density of brine (1045.4 kg/m^3)
- Ambient ocean salinity (33.5 ppt)
- Brine salinity (62.4 ppt)

- Allowed salinity increase at edge of BMZ (2 ppt)
- Required bulk dilution to reach 2 ppt (62.4-33.5)/2 = 14.45

Due to the predominant influence of the relatively shallow submergence on the limiting (densimetric) Froude number (i.e., on the maximum permissible discharge velocity for a given diameter) so the jets do not reach the surface, that issue is addressed first.

a) Submergence influence on jet velocity, diameter and number:

The maximum allowed height of rise of the upper jet boundary, the initial jet diameter and the initial discharge velocity is related by

$$y_t = 2.2\, F\, D \qquad (1)$$

where: $y_t = 0.9\,(17.8)$

$F = V / (\sqrt{D g \Delta\rho/\rho})$; densimetric Froude number

V = initial jet velocity

D = initial (equivalent) jet diameter

g = acceleration of gravity constant

$\Delta\rho/\rho$ = relative change in water density

Although y_t is thus known, the initial jet velocity and diameter need to be determined. This involves a trial and error process. By selecting a jet diameter D, the jet velocity V is calculated from equation 1. The jet area (for the selected D) times the velocity is the flow per jet. This is divided into the total flow to determine the number of jets required. Since the number of jets must be an integer (no fractions), this process is repeated by varying D around the initial value until an integer number of jets results. The trial and error process may be repeated for other selected diameters to result in a range of practical number of integer jets (e.g., from about 5 to 20), each integer number of jets corresponding to a different initial jet diameter and velocity. Any combination of such jet diameter and velocity so determined satisfies equation 1 and yields a maximum height of jet boundary rise of 90% of the available submergence. This means there is no interaction of the jets with the surface for any option selected.

b) Spacing of jets and header pipe length

The above characteristics (and those discussed below) are valid for single jets. Although correction factors to account for the reduction in dilution for co-mingling of diffuser jets are provided based on test data by Roberts (Roberts, 2018a), it is preferable to space the jets in a linear diffuser so they do not mingle. Jets will not interfere with each other if their spacing s_p along a linear diffuser is

$$s_p > 2\,F\,D \qquad (2)$$

This spacing is perpendicular to the jet direction, so if the jets are oriented to have a discharge component in the direction of the header pipe, the jet spacing along the header pipe will be larger. This arrangement of jets may be needed to create an off-shore component of momentum so that the brine plume does not come back over the diffuser to be re-entrained during a tidal flow reversal. An initial off-shore momentum also helps provide an unobstructed path for ambient ocean water to be entrained into the jets.

The header length L depends on the jet spacing, their number and any extra length needed for construction or to avoid interference with other structures. Using N as the number of jets along the header side having the most (or equal) jets (for a two sided discharge) or for jets only on one side of the header pipe,

$$L = (N - 1)\,s_p \quad + \text{extra} \qquad (3)$$

where: extra = length needed for construction, to avoid interference or if a jet extends beyond the header

c) Entrained flow

Dilution occurs as ambient water is pulled into the jets. This entrained flow mixes with the brine and reduces the salt concentration. Flow shear (change in velocity per distance) due to small (e.g., 1 mm) eddies can impact organisms entrained into the jets. The only region of the jets where this is of concern is the region up to the jet's maximum (terminal) height of rise. The falling portion of the jets is not momentum driven and is not of concern. Therefore, the entrained flow to the terminal rise is to be quantified and minimized without excessive enlargement of the Brine Mixing Zone (BMZ).

The centerline dilution to the terminal rise point may be calculated using the following equation:

$$S_t = 0.6\,F \qquad (4)$$

where S_t = centerline dilution at terminal rise

To obtain the bulk (average) dilution in the entire jet at the terminal rise, the centerline dilution is multiplied by 1.4, so the total jet dilution at the terminal rise point is

$$S_a = 1.4\,(0.6)\,F \qquad (5)$$

where S_a = average or bulk dilution = Q_{total}/Q_o

Since S_a is defined as Q_{total}/Q_o, the total flow in the jet may be calculated and the initial flow is subtracted to obtain the entrained flow. That is

$$Q_e = S_a\,Q_o - Q_o = Q_o\,(S_a - 1) \qquad (6)$$

where Q_e = entrained flow

This process is repeated for other locations using the appropriate equations for dilution in place of equation (4) and the distances to the impact point and to the end of the "near field" (limit of turbulence) is determined (see below). The dilutions at and distances to these downstream points are used to interpolate the dilution versus distance to obtain the boundaries of the BMZ where the salinity increase over ambient is no more than 2 ppt. As indicated by the inputs, this boundary occurs at a dilution of 14.45. Since no points may be above 2 ppt, only the centerline (maximum) values are considered.

Centerline dilution at and the distance to the impact point are given by:

$$S_i = 1.6\,F \qquad (7)$$

and $$X_i = 2.4\,FD \qquad (8)$$

Centerline dilution at and distance to the end of the near field are given by:

$$S_n = 2.6\,F \qquad (9)$$

and $$X_n = 9.0\,FD \qquad (10)$$

Unless the required dilution of 14.45 or more is obtained at the impact point, the distance to the boundary of the BMZ (i.e. where the dilution is 14.45) is determined by linear interpolation of the dilution between the calculated distances to the impact point and the end of the near field. The coefficients used in the above equations only apply to 60 degree nozzles and were developed by Roberts based on experimental observations. Other angles would have different coefficients.

d) Area of Brine Mixing Zone (BMZ)

The above calculated distances to the required dilution of 14.45 correspond to a salinity of 2 ppt over ambient along the path of the jets. The resulting shape of the BMZ, in accordance with Roberts 2018a, is shown in Figure 1, where X_2 equals the distance to a dilution of 14.45 from the nozzles.

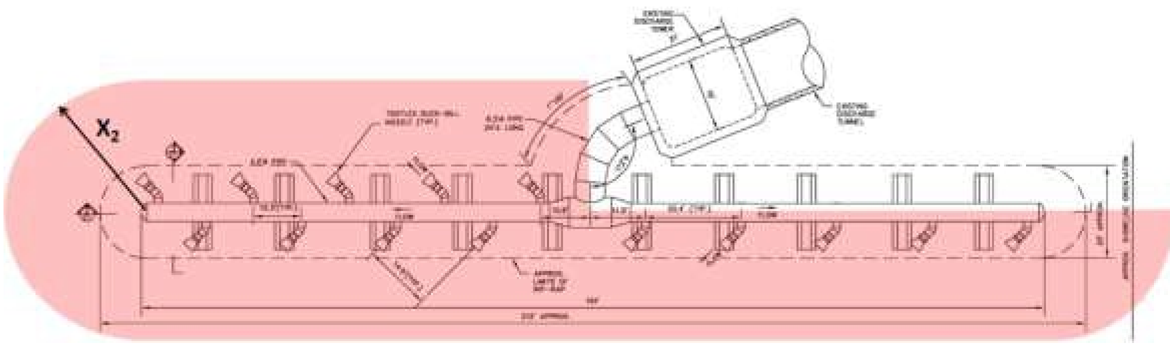


Figure 1 Outline of the BMZ Area

For the portion of pipe with jets on both sides of the header pipe, the BMZ area is the same as a rectangle with a width equal to twice X_2 times the length of that portion of the header pipe (with any extensions as per equation (3) above), plus a semicircle with a radius equal to X_2. For the portion of the proposed diffuser with jets on only one side of the header pipe, the resulting (additional) shape of the BMZ is a rectangle with a width of X_2 and length equal to that portion of the header pipe, plus a quarter circle with a radius of X_2. So the conservative BMZ area is given by

$$A = X_2 L_s + 2 X_2 L_a + \tfrac{3}{4} \pi X_2^2 \qquad (11)$$

where X_2 = distance to 2 ppt limit

L_s = length of pipe with all jets on same side of header

L_a = length of pipe with jets on alternating sides of header

2.2 Proposed Design

Alden developed the diffuser design for Poseidon's proposed HBDP facility. The design was developed following procedures described in Roberts 2018a along with the assumptions presented above. The design of the linear diffuser is shown in Appendix A.

The design utilizes the existing 14 foot diameter HBGS discharge tunnel extending approximately 1,500 feet offshore that terminates in a vertical riser that is 14.2 feet below

MLLW. The proposed diffuser design connects to the tower via a 6.5 foot diameter pipe that connects to a 4 foot diameter header pipe at a tee junction. The header pipe is oriented perpendicular to the shoreline to minimize wave forces acting on the header. The proposed rip-rap area around the diffuser has a total footprint of approximately 4,433 square feet.

The header pipe has fourteen ports capped with tide check (duck bill) valves at angles that are oriented 60 degrees upward in profile view and 45 degrees to the pipe in plan view to provide net off-shore momentum. The port depth is 17.8 feet below MLLW. This submergence is significantly less than the submergence used by Roberts in Roberts 2018b. Roberts used a port depth of 27 feet. This resulted in a greater port depth allowing Roberts to use fewer ports with a higher outflow velocity given the greater height to the jet top.

The duck bills are oriented relative to each other to provide adequate flow separation for entrainment of ambient ocean water into each discharge jet with spacing of 20.4 feet along the header pipe. The jet velocity from each of the fourteen ports is 5.3 ft/sec at a discharge flow rate of 62.5 MGD. During the design phase, the duck-bill check valve vendor will need to optimize a design that provides the desired discharge area (velocity) at the design flow.

2.3 UM3 Model Entrained Flow Calculation for Proposed Design

The UM3 model for the Huntington Beach diffuser design was developed using the same input values as those for the equations based on empirical evidence. UM3 determines the average dilution (S_{ta}) and centerline dilution at points along the plume. The average dilution is used to determine the entrained flow at the “local maximum rise” location. This is the highest point to which the plume rises before the brine plume starts to sink due to its greater density. UM3 was run for the proposed design following the suggested procedure in Roberts 2018a, pp.26-30. The entrained flow is given by

$$Q_e = n\, Q_j\, (S_{ta} - 1) \qquad (12)$$

where n = number of ports

S_{ta} = average dilution computed by UM3 at the terminal rise height

Q_j = flow per jet

Appendix B includes a UM3 output of the proposed diffuser design.

2.4 Summary

A summary of the diffuser details, calculation results using empirical equations, and UM3 results for the proposed design of the linear diffuser that minimizes entrainment flow is shown in Table 3.

Table 3 Summary of diffuser details and BMZ results for 62.5 MGD brine discharge

Diffuser Details					BMZ Results			
No. of ports	Equiv Dia. (in)	Angle Θ (deg)	Jet Velocity u (ft/s)	Froude number F	Benthic Impact of salinity of 2 ppt above ambient (Acres)	BMZ Radius* (ft)	UM3 Dilution (S_{ta})	UM3 Entrained Flow (mgd)
14	15.4	60	5.32	5.66	0.64	63 .2	2.77	168

*BMZ radius is the distance from the nozzle along the jet to where salinity is 2 ppt above ambient.

2.5 Head Loss Analysis for the Proposed Design

Alden previously estimated head loss of Poseidon's proposed HBDP discharge system which was summarized in TMs dated March 22, 2017 (Alden, 2017a) and April 26, 2017 (Alden, 2017b). The TMs described the head loss calculation methodology and provided head loss estimates for both onshore and offshore components of the discharge system at a discharge flow rate of 127 MGD. These head loss calculations have been updated to reflect the proposed fourteen port linear diffuser design (see Appendix A), replacing the previously proposed multiport rosette design. Only the offshore portions of the design have been changed, therefore the previous onshore estimates of head loss are still valid and do not require updating.

Head loss calculation assumptions:

- Total discharge flow of 127 MGD
- 14 port linear diffuser design as shown in Appendix A
- Equal flow discharged from each nozzle
- Equivalent nozzle diameter of 1.28 ft
- Friction coefficient depicting rough surfaces for existing conduits and smooth surfaces for new linear diffuser piping.

The head loss estimates for the linear diffuser design are shown in Table 4. The total offshore head loss is estimated at 3.51 ft which includes losses through the 14 ft diameter 2,130 ft long discharge pipe, discharge riser, linear diffuser piping and tide valve nozzles for a discharge flow of 127 MGD. This head loss is less than the previous multiport rosette design of 3.76 ft for the 127 MGD discharge flow condition.

Table 4 HBDP offshore discharge system calculated head losses for a discharge of 127 MGD

Description	Head loss (ft)	Notes
Existing 14 ft dia. discharge pipe	0.18	friction losses along 2,130 ft long existing pipe
Linear diffuser piping	1.49	friction and transition losses through riser and diffuser conduits
Tide valve nozzle	1.85	losses through discharge ports
Total	**3.51**	

References

Alden, 2017a. *Technical Memorandum, Summary of Head Loss Calculations for the Poseidon Huntington Beach Desalination Plant Discharge System, March 22, 2017,* Holden, MA: Alden Research Laboratory, Inc..

Alden, 2017b. *Technical Memorandum, Addendum to Supplement March 22, 2017 Technical Memo "Summary of Head Loss Calculations for the Poseidon HBDP Discharge System" and March 31, 2017 Technical Memo "Diffuser Head for Co-located and Stand-alone Operation of HBDP", April 26, 2017,* Holden, MA: Alden Research Laboratory, Inc..

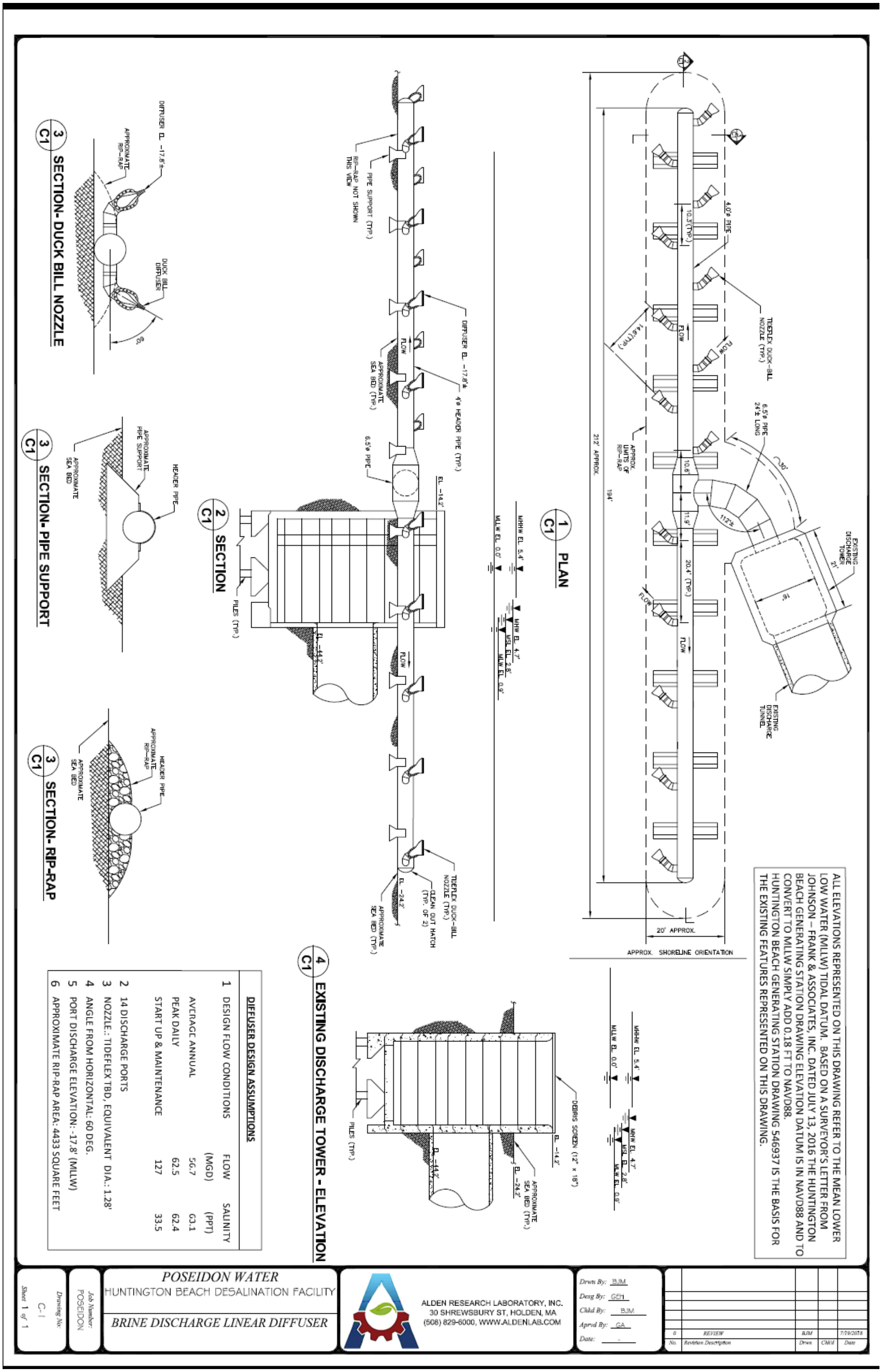
Palomar, P., Lara, J. & Losada, I., 2012. Near field brine modeling part 2: Validation of commercial tools. *Desalination,* Volume 290, pp. 28-42.

Roberts, P., 2018a. *Brine Diffusers and Shear Mortality,* Atlanta, GA: prepared for Eastern Research Group.

Roberts, P., 2018b. *Brine Diffusers and Shear Mortality: Application to Huntington Beach, Final Report,* Atlanta, GA: prepared for Eastern Research Group.

Appendix A

Proposed Linear Diffuser Design


ALL ELEVATIONS REPRESENTED ON THIS DRAWING REFER TO THE MEAN LOWER LOW WATER (MLLW) TIDAL DATUM. BASED ON A SURVEYOR'S LETTER FROM JOHNSON – FRANK & ASSOCIATES, INC. DATED JULY 13, 2016 THE HUNTINGTON BEACH GENERATING STATION DRAWING ELEVATION DATUM IS IN NAVD88 AND TO CONVERT TO MLLW SIMPLY ADD 0.18 FT TO NAVD88.
HUNTINGTON BEACH GENERATING STATION DRAWING 546937 IS THE BASIS FOR THE EXISTING FEATURES REPRESENTED ON THIS DRAWING.
EXISTING DISCHARGE TOWER
EXISTING DISCHARGE TUNNEL
TIDEFLEX DUCK-BILL NOZZLE (TYP.)
6.5'ø PIPE 24'± LONG
4.0'ø PIPE
10.3'(TYP.)
20.4' (TYP.)
14.6'(TYP.)
FLOW
APPROX. LIMITS OF RIP-RAP
194'
212' APPROX.
20' APPROX.
APPROX. SHORELINE ORIENTATION
1 C1 PLAN
MHHW EL 5.4'
MHW EL 4.7'
MSL EL 2.8'
MLW EL 0.9'
MLLW EL 0.0'
DIFFUSER EL -17.8'±
4'ø HEADER PIPE (TYP.)
EL -14.2'
PIPE SUPPORT (TYP.)
RIP-RAP NOT SHOWN THIS VIEW
APPROXIMATE SEA BED (TYP.)
6.5'ø PIPE
CLEAN OUT HATCH (TYP. OF 2)
EL -24.2'
EL -44.2'
PILES (TYP.)
2 C1 SECTION
DEBRIS SCREEN (12" x 18")
4 C1 EXISTING DISCHARGE TOWER - ELEVATION
DUCK BILL DIFFUSER
APPROXIMATE RIP-RAP
60°
3 C1 SECTION- DUCK BILL NOZZLE
HEADER PIPE
APPROXIMATE PIPE SUPPORT
APPROXIMATE SEA BED
3 C1 SECTION- PIPE SUPPORT
3 C1 SECTION- RIP-RAP
DIFFUSER DESIGN ASSUMPTIONS
1 DESIGN FLOW CONDITIONS FLOW (MGD) SALINITY (PPT)
AVERAGE ANNUAL 56.7 63.1
PEAK DAILY 62.5 62.4
START UP & MAINTENANCE 127 33.5
2 14 DISCHARGE PORTS
3 NOZZLE.: TIDEFLEX TBD, EQUIVALENT DIA.: 1.28'
4 ANGLE FROM HORIZONTAL: 60 DEG.
5 PORT DISCHARGE ELEVATION: -17.8' (MLLW)
6 APPROXIMATE RIP-RAP AREA: 4433 SQUARE FEET
POSEIDON WATER
HUNTINGTON BEACH DESALINATION FACILITY
BRINE DISCHARGE LINEAR DIFFUSER
Job Number: POSEIDON
Drawing No: C-1
Sheet 1 of 1
ALDEN RESEARCH LABORATORY, INC.
30 SHREWSBURY ST, HOLDEN, MA
(508) 829-6000, WWW.ALDENLAB.COM
Drwn By: BJM
Desg By: GEH
Chkd By: BJM
Aprvd By: GA
0 REVIEW BJM 7/19/2018
No. Revision Description Drwn Chk'd Date

Appendix B

UM3 Results

Contents of the memo box (may not be current and must be updated manually)
Project "C:\Plumes\Plumes\UM3 Port Number
Determination" memo
memoRuns" memo

Model configuration items checked: Report effective dilution; Current vector averaging;
Channel width (m) 100
Start case for graphs 1
Max detailed graphs 10 (limits plots that can overflow memory)
Elevation Projection Plane (deg) 0
Shore vector (m,deg) not checked
Bacteria model : Mancini (1978) coliform model
PDS sfc. model heat transfer : Medium
Equation of State : S, T
Similarity Profile : Default profile (k=2.0, ...)
Diffuser port contraction coefficient 1
Light absorption coefficient 0.16
Farfield increment (m) 200
UM3 aspiration coefficient 0.1
Output file: text output tab
Output each ?? steps 10
Maximum dilution reported 20
Text output format : Standard
Max vertical reversals : to max rise or fall

/ UM3. 7/24/2018 11:59:10
Case 1; ambient file C:\Plumes\Plumes\UM3 Port Number Determination.001.db; Diffuser table record 11:

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.0	90.00	33.50	20.00	0.0	0.0	-	-	0.0	23.64277
7.380	0.0	90.00	33.50	20.00	0.0	0.0	-	-	0.0	23.64277

Diffuser table:

P-dia	VertAng	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(deg)	(deg)	(m)	(m)	()	(ft)	(m)	(concent)	(ft)	(MGD)	(psu)	(C)	(ppm)
1.2800	60.000	45.000	0.0	0.0	14.000	14.360	100.00	0.0	17.800	62.500	62.400	22.000	1000.0

Simulation:
Froude No: -5.797; Strat No: 0.0000; Spcg No: 11.22; k: 1.64E+5; eff den (sigmaT) 45.40553; eff vel 1.636(m/s);
Current is very small, flow regime may be transient.

Step	Depth (ft)	Amb-cur (m/s)	P-dia (ft)	Polutnt (ppm)	net Dil ()	netCLdil ()	x-posn (ft)	y-posn (ft)	Iso dia (m)
0	17.80	1.000E-5	1.280	1000.0	1.000	0.0	0.0	0.0	0.3901;
10	17.24	0.0	1.535	829.7	1.205	1.000	0.232	0.232	0.4678;
20	16.50	0.0	1.896	678.5	1.474	1.000	0.544	0.544	0.5778;
30	15.60	0.0	2.357	555.2	1.801	1.000	0.942	0.942	0.7184;
40	14.52	0.0	2.959	455.6	2.195	1.097	1.457	1.457	0.9020;
50	13.64	0.0	3.520	397.7	2.515	1.257	1.919	1.919	1.0729;
60	13.02	0.0	3.966	364.6	2.743	1.371	2.284	2.284	1.2088;
70	12.55	0.0	4.338	343.0	2.915	1.458	2.586	2.586	1.3223;
80	12.19	0.0	4.659	327.8	3.051	1.526	2.843	2.843	1.4201;
90	11.91	0.0	4.940	316.3	3.161	1.581	3.068	3.068	1.5059;
100	11.68	0.0	5.191	307.4	3.253	1.627	3.268	3.268	1.5822;
110	11.50	0.0	5.416	300.2	3.331	1.666	3.447	3.447	1.6507;
117	11.39	0.0	5.560	295.9	3.380	1.690	3.564	3.564	1.6947; begin overlap;
120	11.35	0.0	5.618	294.3	3.398	1.699	3.612	3.612	1.7123;

130	11.22	0.0	5.790	289.8	3.450	1.725	3.763	3.763	1.7649;	
140	11.12	0.0	5.938	286.4	3.491	1.746	3.904	3.904	1.8098;	
150	11.03	0.0	6.065	283.7	3.525	1.762	4.037	4.037	1.8486;	
160	10.96	0.0	6.176	281.5	3.553	1.776	4.164	4.164	1.8823;	
170	10.91	0.0	6.272	279.6	3.577	1.788	4.285	4.285	1.9116;	
180	10.86	0.0	6.355	277.9	3.598	1.799	4.401	4.401	1.9370;	
190	10.82	0.0	6.426	276.5	3.617	1.808	4.513	4.513	1.9588;	
200	10.80	0.0	6.487	275.2	3.634	1.817	4.623	4.623	1.9773;	
210	10.78	0.0	6.538	273.9	3.650	1.825	4.731	4.731	1.9927;	
220	10.77	0.0	6.579	272.8	3.666	1.833	4.837	4.837	2.0052;	
230	10.76	0.0	6.611	271.7	3.681	1.840	4.941	4.941	2.0150;	
231	10.76	0.0	6.613	271.6	3.682	1.841	4.952	4.952	2.0158;	local maximum rise or fall;
240	10.77	0.0	6.634	270.6	3.695	1.848	5.046	5.046	2.0221;	
250	10.78	0.0	6.649	269.5	3.710	1.855	5.150	5.150	2.0266;	
260	10.80	0.0	6.656	268.4	3.725	1.863	5.255	5.255	2.0288;	
270	10.82	0.0	6.656	267.3	3.741	1.870	5.361	5.361	2.0287;	
280	10.86	0.0	6.648	266.2	3.757	1.879	5.469	5.469	2.0264;	
290	10.90	0.0	6.634	264.9	3.775	1.888	5.579	5.579	2.0220;	
300	10.95	0.0	6.614	263.5	3.795	1.897	5.691	5.691	2.0158;	
310	11.02	0.0	6.588	262.0	3.816	1.908	5.808	5.808	2.0079;	
320	11.10	0.0	6.557	260.4	3.841	1.920	5.928	5.928	1.9986;	
330	11.19	0.0	6.523	258.4	3.869	1.935	6.053	6.053	1.9882;	
340	11.29	0.0	6.487	256.2	3.903	1.951	6.184	6.184	1.9772;	
350	11.42	0.0	6.450	253.6	3.943	1.972	6.322	6.322	1.9660;	
360	11.57	0.0	6.416	250.5	3.992	1.996	6.467	6.467	1.9556;	
370	11.74	0.0	6.388	246.7	4.054	2.027	6.622	6.622	1.9469;	
379	11.93	0.0	6.371	242.6	4.123	2.061	6.770	6.770	1.9418;	end overlap;
380	11.95	0.0	6.369	242.1	4.131	2.066	6.787	6.787	1.9414;	
390	12.19	0.0	6.357	236.8	4.223	2.111	6.964	6.964	1.9375;	
400	12.48	0.0	6.347	231.0	4.330	2.165	7.155	7.155	1.9346;	
410	12.83	0.0	6.344	224.4	4.456	2.228	7.363	7.363	1.9337;	
420	13.26	0.0	6.351	217.0	4.607	2.304	7.590	7.590	1.9359;	
430	13.77	0.0	6.374	208.7	4.792	2.396	7.841	7.841	1.9428;	
440	14.41	0.0	6.420	199.1	5.023	2.512	8.119	8.119	1.9567;	
450	15.22	0.0	6.498	188.1	5.317	2.658	8.432	8.432	1.9807;	
460	16.25	0.0	6.625	175.4	5.700	2.850	8.785	8.785	2.0193;	
470	17.59	0.0	6.821	160.9	6.213	3.107	9.189	9.189	2.0790;	
480	19.36	0.0	7.119	144.4	6.925	3.463	9.654	9.654	2.1699;	
490	21.79	0.0	7.571	125.8	7.952	3.976	10.20	10.20	2.3078;	
495	23.35	0.0	7.881	115.7	8.646	4.323	10.50	10.50	2.4021;	bottom hit;
500	25.22	0.0	8.265	105.2	9.510	4.755	10.84	10.84	2.5191;	
510	29.46	0.0	9.173	86.23	11.60	5.798	11.49	11.49	2.7960;	
520	34.21	0.0	10.23	70.72	14.14	7.071	12.09	12.09	3.1183;	
530	39.54	0.0	11.45	58.00	17.24	8.621	12.65	12.65	3.4887;	
538	44.28	0.0	12.54	49.49	20.21	10.10	13.08	13.08	3.8223;	stop dilution reached;

Horiz plane projections in effluent direction: radius(m): 0.0; CL(m): 5.6402
Lmz(m): 5.6402
forced entrain 1 0.0 -8.070 3.822 0.122
Rate sec-1 0.0 dy-1 0.0 kt: 0.0 Amb Sal 33.5000
;
11:59:10. amb fills: 4

605 THIRD STREET
ENCINITAS, CALIFORNIA 92024
T 760.942.5147 F 760.632.0164

MEMORANDUM

To:	Josie McKinley, Poseidon Water
From:	Joe Monaco
Subject:	Quantification of Dredge Materials for the Huntington Beach Desalination Project Intake and Discharge Modifications
Date:	May 17, 2019
cc:	
Attachment(s):	A - Figures

The following information is provided in response to a request by the Santa Ana Regional Water Quality Control Board (RWQCB) to provide additional detail on the quantities of dredged sediment resulting from modification of the intake and discharge facilities for the Huntington Beach Desalination Project (HBDP). Specifically, this analysis confirms that the volume of dredged sediments are within the range of estimates evaluated in the 2017 Supplemental Environmental Impact Report (SEIR) prepared by the California State Lands Commission related to the lease amendments required for the project – hereinafter referred to as the 2017 SEIR.

The 2017 SEIR assessed dredging activities associated with the installation of the intake screen arrays. With respect to the intake array, the 2017 SEIR estimated that approximately 1,000 to as much as 3,300 cubic yards (cy) of sediment would be excavated, and the material would be side casted and naturally redistributed on the ocean floor or may require land disposal. A specific quantification of dredging/excavation was not provided for installation of the diffuser on the discharge tower, because the 2017 SEIR assumed that surface preparation involved only side-casting the existing rip rap. Since the 2017 SEIR, the diffuser has been modified and approximately 300 cy of seabed leveling/dredging may be required. The RWQCB has requested that the seabed leveling/dredging associated with the modified diffuser installation be quantified to ensure that, in the event that land disposal of the sediments is required, that all related environmental effects are addressed. In responses to the RWQCB to information requests related to an application filed by Poseidon for a determination under CA Water Code Section 13142.5(b), Poseidon had indicated that the maximum quantity of 3,300 cy of total sediment excavation/disposal was considered to be a “worst case” estimate, and would also accommodate the smaller quantities of excavation needed for the diffuser. Additional support for that assessment is provided in this memo.

INTAKE SCREEN INSTALLATION

As initially indicated by Poseidon, final design of the intake modifications would include geotechnical investigations and design refinements to more accurately assess excavation quantities. To address the RWQCB’s request, the preliminary design’s dredging calculations have been refined sufficiently to provide confirmation of dredging quantities. As shown in the attached drawings, excavation for the intake structure is required to house the manifold that would be attached to the existing intake structure. The conceptual design, prepared by Alden Research Laboratory, Inc. (Alden) was evaluated in the 2017 SEIR. The conceptual design included a manifold pipeline six

Subject: Quantification of Dredge Materials for the Huntington Beach Desalination Project Intake and Discharge Modifications

feet in diameter. See Attachment A for preliminary design details. Assuming an 11-foot deep trench and a five-foot allowance for cover and 6:1 side slopes, Alden estimated a dredge quantity of 2,700 cy,

DIFFUSER INSTALLATION

In 2018, the RWQCB requested that Poseidon consider redesigning the proposed diffuser based on the analysis found in an April 18, 2018 report entitled Brine Diffusers and Shear Mortality: Application to Huntington Beach prepared by Philip J. W. Roberts, PhD, PE. The redesign incorporates a linear diffuser arrangement which would be placed immediately adjacent to the existing discharge tower. In July, 2018, to ensure that the linear diffuser was within the SLC lease area, the linear diffuser was slightly realigned. See Attachment A for preliminary design details.

The linear diffuser would require seabed leveling/dredging for approximately 2 - 100 feet by 20 feet areas. As noted in the 2017 SEIR, minor leveling of the seabed would be required for construction of the diffuser. The leveling would occur directly beneath the linear diffuser to provide a uniform, firm surface to place the pipe supports. The total area requiring leveling would be approximately 300 cy.

CONCLUSION

Based on the foregoing analysis, the total estimated quantity of dredged material that could potentially require side casting and natural redistribution on the ocean floor or land disposal would be approximately 3,000 cy which less than 3,300 cy analyzed in the 2017 SEIR.

Attachment A

Figures